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MANUAL

OF

GYNECOLOGY

BY

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TO

OUR FRIEND AND TEACHER,

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PROFESSOR OF MIDWIFERY AND DISEASES OF WOMEN AND CHILDREN
IN THE UNIVERSITY OF EDINBURGH.

PREFACE.

In writing this Manual we have tried to keep before our eyes the great principle that the Anatomy, Physiology and Pathology of the Pelvic Organs form the foundation of good Clinical work. As students we felt the want of a text-book based on this principle and embodying the most recent views from the various literatures instead of giving those of one school. This want we have endeavoured to supply.

Our thanks are due to Professor Simpson for his kind advice in matters of difficulty; and specially to Mr. J. A. Melville, for the literary revision of the text and the preparation of the copious Table of Contents and Indexes. We have in all cases acknowledged the source of every illustration not specially prepared for this work.

D. B. HART.
A. H. BARBOUR.

EDINBURGH.

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SECTION I.

ANATOMY AND PHYSIOLOGY OF THE FEMALE PELVIC ORGANS.

In order to give a comprehensive idea of the Anatomy and Physiology of the Female Pelvic Organs, it will be advisable to consider it in the following manner:

Chapter I. (1.) The External Genitals as observed clinically. (2.) The Pelvic floor and organs resting on it considered as a whole. (3.) The Pelvis considered in detail as follows:—Musculature of Pelvic Floor; Uterus, Fallopian Tubes, and Ovaries; Vagina; Bladder; Rectum and Perineal Body; Peritoneum and Connective Tissue.

Chapter II. The position of the Uterus and its annexa, and the Viscera superjacent to the Pelvic Organs.

Chapter III. The Structural Anatomy of the Pelvic Floor; Pelvic Floor Projection.

Chapter IV. The Blood-vessels, Lymphatics, and Nerves of the Pelvis. Development of Pelvic Organs.

Chapter V. Physics of the Abdomen and Pelvis with special reference to the Semiprone and Genupectoral Postures.

Chapter VI. Ovulation and Menstruation.

CHAPTER I.

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(1.) EXTERNAL GENITALS AS OBSERVED CLINICALLY.

UNDER the term external genitals are comprised the structures known as Labia Majora, Fourchette, Labia Minora, Clitoris with its prepuce, Vestibule, and Fossa Navicularis. For clinical convenience the urethral orifice and hymen also are described with these; although the urethral orifice belongs to the urinary system, and the hymen separates anatomically the external genitals (vulva) from the vagina.

The *Labia Majora* (Fig. 1, *a*) are two thick folds of hair-clad skin, running parallel to the anteroposterior diameter of the pelvic outlet, extending from the symphysis pubis backwards between the thighs, and meeting each other posteriorly in the middle line about 2.7 cm. (1 inch) in front of the anus. Each labium has an outer and inner surface, and consists of a thick fold of skin enclosing a quantity of fat, blood-vessels, and dartos. Superiorly, where they are best developed, they form by their junction—anterior commissure—the structure known as the mons veneris (*vide* Plate I.); while posteriorly, they are a mere fold of skin known as the *Fourchette* or posterior commissure. The fat and connective tissue are therefore almost entirely wanting at the fourchette, which is not a distinct structure but is simply the posterior junction of the thinned-out labia majora. Both labia are, in the adult, covered with crisp hair which is most abundant over the mons veneris and outer surface, but very much less on the inner.

The *Labia Minora* (Fig. 1, *b*) are two small oblique folds of skin, one on the inner surface of each labium majus. Posteriorly they blend insensibly with the labium majus at about its middle, while anteriorly they converge and each divides into two small branches, an upper and a lower. The upper branches meet to form the prepuce of the clitoris (Fig. 1, *c*), while the lower in a similar way form its suspensory ligament. As a rule

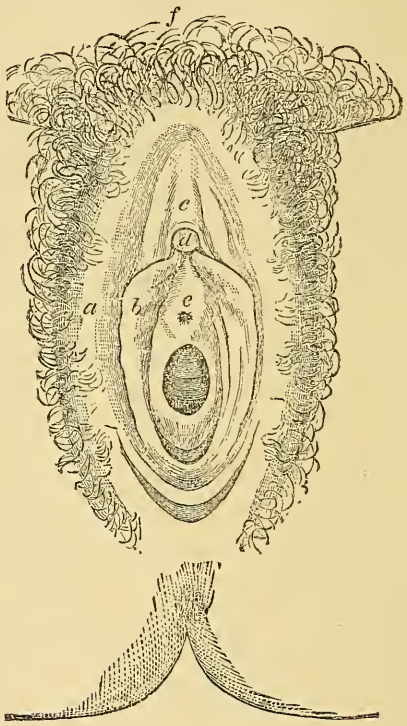


FIG. 1.

External genitals of virgin, with diaphragmatic hymen. The labia majora and minora are drawn apart, and the prepuce drawn back. *a*, labium majus; *b*, labium minus; *c*, præputium clitoridis; *d*, glans clitoridis; *e*, vestibule just above urethral orifice; *f*, mons veneris (1/1).

the labia minora do not, in the adult, project beyond the labia majora. Sebaceous glands are present on both labia.

The *Clitoris*, covered by its prepuce, lies in the middle line and at the apex of the smooth piece of mucous membrane known as the vestibule. Only that part analogous to the glans penis is seen (Fig. 1, *d*). The clitoris proper consists of two crura which arise from the rami of the ischium and pubis and unite separately to form the body of the clitoris, which lies beneath the mucous membrane. The glans clitoridis is not

directly continuous with the body, but joins it through the pars intermedia of the bulb (*vide post*, p. 10).

The *Vestibule* (Fig. 1, *e*) is a triangular smooth mucous surface, bounded superiorly by the clitoris, laterally by the labia minora, and inferiorly by the upper margin of the vaginal orifice. In the middle line at its base the dimple of the urethral orifice can be distinctly felt 2–2.5 cm. (1 inch) in front of fourchette. Small depressions and mucous glands open on its surface.

The *Vaginal Orifice* lies in the middle line between the base of the vestibule and the fossa navicularis. Its orifice is guarded by the *hymen*, a thin fold of mucous membrane enclosing some connective tissue, blood-vessels, and nerves (?). The hymen may be crescentic in shape, attached

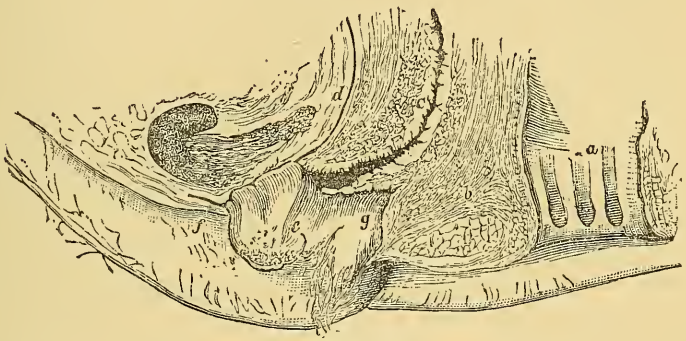


FIG. 2.

Vertical mesial section of external genitals (Henle). *a*, anus; *b*, perineal body; *c*, vagina; *d*, urethra; *e*, labium minus; *f*, prepuce of clitoris; *g*, fossa navicularis, with hymen in front and fourchette behind. (1/1)

to the posterior margin of the vaginal orifice, and with free edge toward the base of the vestibule (Figs. 2 and 5); or diaphragmatic, attached all around the vaginal orifice, but with a small hole (Figs. 1 and 4), or vertical slit (Fig. 3) in it. Sometimes it is not so perforated, constituting a pathological condition.

Fossa Navicularis.—Normally, the inner aspect of the fourchette is in contact with the outer and lower surface of the hymen. When the fourchette is pulled down by the finger, a boat-shaped cavity is made—the fossa navicularis. Its posterior boundary is, therefore, the inner aspect of the fourchette; its anterior, is the posterior aspect of the hymen. These two are in contact unless artificially separated. The ducts of the Bartholinian glands open into the fossa by small pin-hole apertures (Fig. 2).

From behind forwards, in the female ano-vulvar region there lie in the middle line the following structures :—

(1.) Anus.
(2.) Skin over base of Perineal Body.
(3.) Fourchette.
(4.) Fossa Navicularis.
(5.) Vaginal orifice, with Hymen or its remains.
(6.) Urethral orifice.
(7.) Vestibule.
(8.) Clitoris with its prepuce.

Laterally we have the labia majora and minora.

The following points should be carefully noted. In the nude erect female only the mons veneris is seen (*vide* Plate I.). The well-developed labia majora have their inner surfaces always in contact and are only slightly separated by the widest divergence of the knees. The labia minora are always in contact and require to be artificially separated in order to see their inner surfaces. The fossa navicularis only exists when artificially opened up. Therefore, to see the external genitals fully, the labia must be separated and the prepuce drawn back.

A line running as follows separates mucous membrane from skin. Starting from the base of the inner aspect of the right labium minus, it passes *down* beside the base of the outer aspect of the hymen, *up* along the base of the inner aspect of the left labium minus, *in* beneath the prepuce of the clitoris, and *down* to where it first started from.

The vulvar slit is vertical, and lies in the middle line between the labia majora and minora.

The vaginal orifice is transverse, only exists when artificially made, and is anatomically defined by the hymen which separates the external genitals from the internal genitals. The sharp line between skin and mucous membrane can be distinctly seen on the living woman. The labia minora are skin, thin and fine, and not mucous membrane as often alleged.

The following measurements by Foster are useful for reference :—

	Tip of Coccyx to anus.	*Anus to fourchette.*
Average distance in nulliparæ, . .	4.5 cm.	2.7 cm.
" " multiparæ, . .	4.7 cm.	2.5 cm.

Meatus urinarius, 2–2.5 cm. from fourchette, in nulliparæ ; 2–3.1 cm., in women who have borne children.

The virginal vaginal orifice should have the appearances shown at Figs. 1, 3, 4, and 5, and the free edge of the hymen should be intact.

In a healthy woman who has experienced complete coitus, the hymen is torn or often only stretched. It admits two fingers without pain. In

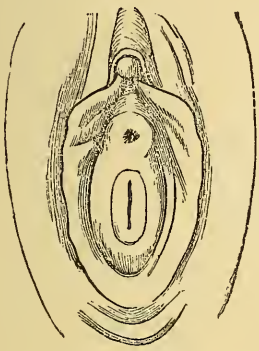


Fig. 3.
Hymen of virgin with vertical slit. (1/1)

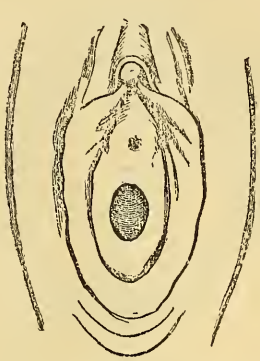


Fig. 4.
Hymen with oval opening. (1/1)

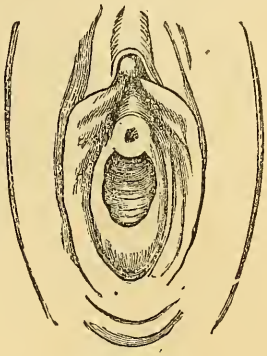


Fig. 5.
Crescentic hymen. (1/1)

a woman who has borne full-time children, the vaginal orifice is always torn though the fourchette and all behind it may be intact. The remains of the hymen are known as the carunculæ myrtiformes. In addition, the passage of the child's head may cause tears of the posterior vaginal wall, perineal body, or even anterior wall of rectum.

(2.) THE PELVIC FLOOR AND ORGANS RESTING ON IT CONSIDERED AS A WHOLE.

The outlet of the bony female pelvis is filled in by what is generally described as the "soft parts." This term, however, should not be employed, as it is misleading, especially in scientific obstetrics. It is better named the pelvic floor or pelvic diaphragm.

The pelvic floor is a thick fleshy elastic layer, dovetailed in all round to the bony pelvic outlet (Fig. 6). It may be considered as an irregularly-edged segment of a hollow sphere, with an outer *skin* aspect and an inner *peritoneal* one. On the outer skin aspect lie the external genitals already described. On the inner peritoneal surface, we have the organ known as the uterus, and its appendages, the Fallopian tubes and ovaries. The vagina runs at an angle of 60° to the horizon from the vaginal orifice upwards to the mouth of the womb, as a transverse slit in the pelvic diaphragm. In front of the vagina lies the bladder, while behind it the

rectum is placed ; these structures, along with muscles, connective tissue, blood-vessels, nerves, and lymphatics, making up the pelvic diaphragm.

Figure 1 shows, accordingly, the pelvic floor seen from its convex,

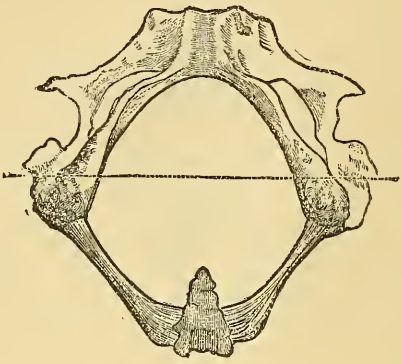


Fig. 6.

Bony pelvic outlet, with transverse line showing rectal and urethral triangles (D. J. Cunningham). (½)

skin aspect ; Fig. 53 gives it and the organs resting on it as viewed from its concave, peritoneal side ; while Fig. 34 displays it as seen in vertical sagittal section.

(3.) THE PELVIS CONSIDERED IN DETAIL.

MUSCULATURE OF THE PELVIC FLOOR.

If a female cadaver be placed in the Lithotomy posture and a transverse line drawn just in front of the ischial tuberosities, the perineal region will be divided into a posterior rectal triangle and an anterior urethral one (Fig. 6). The former contains the anus, the latter the external genitals. By suitable incisions the skin and superficial fascia, fat, &c., can be removed around the anus, and the ischiorectal fossa defined. This is a small pyramidal cavity on each side of the rectum, bounded externally by the obturator internus muscle, internally by the levator ani. Its apex is formed by the junction of these muscles, while its base is partially closed in by the transversus perinei and the edge of the gluteus maximus muscle (Fig. 7). If the skin, superficial fascia, and anterior layer of the triangular ligament be now removed from the urethral triangle, the following muscles, &c., will be exposed (Fig. 7).

Perineal Muscles.—On each side of the vaginal orifice three muscles

lie, viz., the bulbo-cavernosus (Fig. 8, *b c*), erector clitoridis or ischio-cavernosus (Fig. 8, *e c*), and transversus perinei (Fig. 8, *t p*).

The *Bulbo-cavernosi* consist of two muscular slips, one on each side of the vaginal orifice, which spring behind from the perineal body and pass round the vaginal orifice, partly covering the bulb and the vagina (Fig. 7, *c*). The anterior end of each slip splits into three portions, which end as follows:—one passes to the under surface of the corpus cavernosum of the clitoris, a second goes to the posterior surface of the bulb, and a third

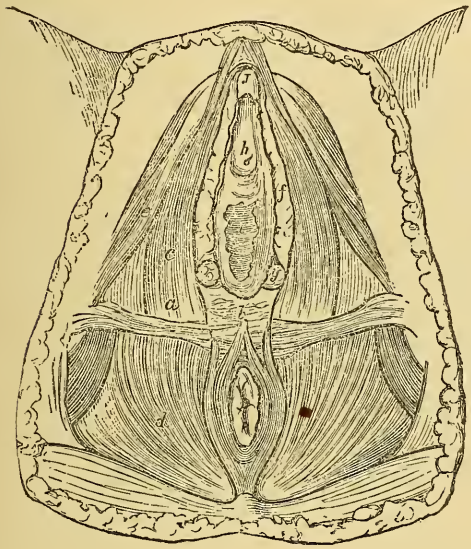


Fig. 7.

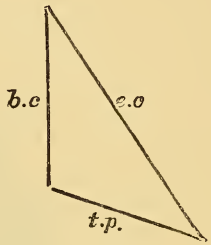


Fig. 8.

Fig. 7.—Dissection of perineal region (Savage). *a*, is just above transversus perinei; *b*, base of perineal body; *c*, bulbo-cavernosus; *d*, lies on levator ani and in ischiorectal fossa; *e*, erector clitoridis; *f*, bulb of vagina; *g*, bartholinian gland; *h*, vestibule; *j*, glans clitoridis. (⅓)

blends with the mucous membrane between the clitoris and urethral orifice (Henle, *v.* Fig. 9).

The *Erector Clitoridis* arises from the inside of the ischial tuberosity, and becomes inserted into back and sides of the crus clitoridis (Fig. 9, *e*).

The *Transversus Perinei* arises from the ramus of the ischium and passes to the perineal body. It is difficult to define practically in dissection (Fig. 7, *a*).

Now that these muscles are defined, we are in a position to localize more important structures.

The *Bulbi Vaginæ* (corpora cavernosa urethræ) are small masses of

erectile tissue about the size of a bean, lying one on each side of the vaginal orifice and partly under cover of the bulbo-cavernosus muscle. Each rests posteriorly on the triangular ligament, internally on the mucous membrane of the vagina ; while, as already said, they are partly covered superiorly by the bulbo-cavernosus muscle. Anteriorly each blends with its fellow, and this *pars intermedia* becomes continuous with the clitoris (Fig. 7, *f*).

The *Bartholinian Glands* lie one on each side of the vaginal orifice, close

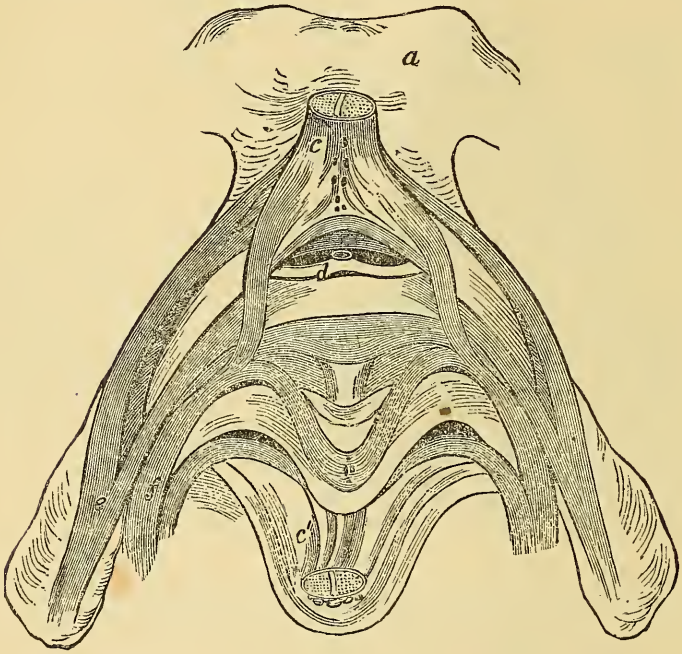


Fig. 9.

a, symphysis pubis, showing muscles in connection with clitoris and bulb. The clitoris, *c*,*c''*, is cut across near its point, and thrown down with the vestibulary mucous membrane (Henle). *e*, erector clitoridis; *f*, bulbo-cavernosus with its three insertions; *d*, venous branch to dorsal vein of clitoris. ($^1/_1$)

to the posterior end of the bulb and behind the anterior layer of the triangular ligament (Figs. 7, *g*, and 10, *e*). Each has a long duct opening into the fossa navicularis.

Between the lower one-third of the posterior wall of the vagina and the anterior wall of the rectum is an angular interspace (Fig. 2, *b*) filled up by the structure known as the perineal body. This will be more fully described afterwards. At the present stage of the dissection only its base is seen, with the following muscles taking origin from or having an inser-

tion into it,—sphincter ani, transversus perinei, bulbo-cavernosus, levator ani (Fig. 7).

Between the layers of the triangular ligament lie the urethra, a portion of the vagina, compressor urethræ, dorsal vein of the clitoris, internal pudic vessels and nerves, the artery to bulb, dorsal nerve of clitoris, and Bartholinian glands (Cunningham).

The dissection of the urethral triangle has now been considered until the bladder has been exposed as it lies behind the pubis from which it is separated by a considerable amount of loose fatty tissue. In order to complete the consideration, we have now to take up the muscles not yet described, viz., the levator ani and coccygeus.

The pelvic floor must now be looked at from its internal concave or

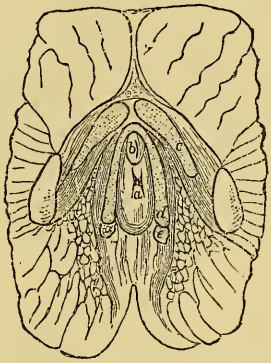


Fig. 10.

Oblique section, parallel to the anterior pelvic wall and through the external genitals (Henle). *a*, vagina; *b*, urethra: *c*, corpus cavernosum clitoridis, covered by its erector; *d*, bulbus vaginæ, covered by bulbo-cavernosus muscle; *e*, Bartholinian gland.

peritoneal aspect. If the peritoneum and connective tissue beneath it, with the nerves and blood-vessels, be removed on one side of the pelvis, say the right, the two muscles known as the coccygeus and levator ani will be exposed. These spring from the middle of the inner side of the true pelvis, and, blending partly directly and partly indirectly with one another, form what may be termed the diaphragmatic muscles of the pelvic floor. If looked at through the pelvic brim, they are seen to form on both sides a concave arrangement analogous to the thoracic diaphragm (Fig. 11).

The *Coccygeus* springs from the spine of the ischium and is inserted into the side of the lower part of the sacrum and side and front of coccyx. There are two coccygei, one on each side (Figs. 11 and 12).

The *Levator Ani* has an extensive origin. It springs in front from the back of the pubis, from the pelvic fascia (white line) and the spine of the ischium. From this the muscle sweeps downwards and inwards to become attached in the middle line from before backwards as follows,—to the

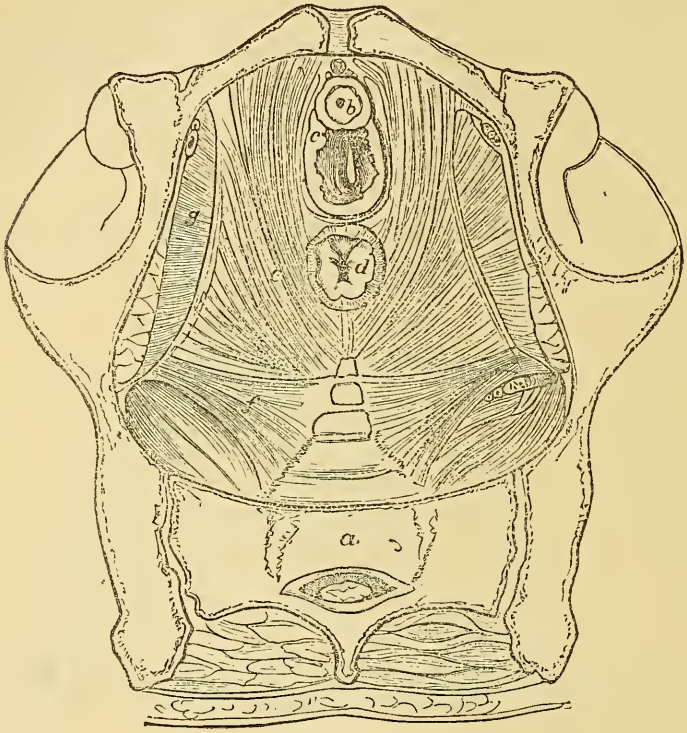


Fig. 11.

Transverse section of pelvis from above (Savage). (½) *a*, sacrum; *b*, urethra; *c*, vagina; *d*, rectum; *e*, levator ani; *f*, coccygeus; *g*, obturator internus.

vagina, the rectum, its fellow of the opposite side, and finally to the tip of the coccyx (Fig. 12).

Luschka's monograph may be consulted for a more minute account.

We have now to take up the consideration of the generative organs. It is difficult to describe these without alluding to structures not fully considered until further on. The student may, therefore, not entirely grasp some of the points until the whole anatomy of the organs has been mastered.

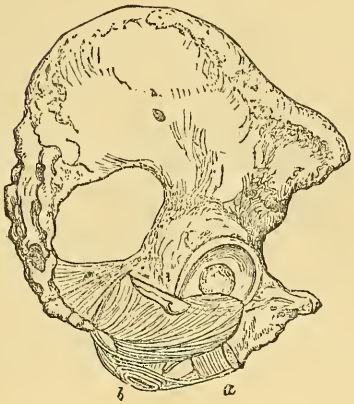


Fig. 12.

Levator ani and coccygeus seen from without, after removal of part of hip-bone and clearing out of ischiorectal fossa (Luschka). *a*, fibres of levator ani on vagina; *b*, anus, with sphincter. (¼)

THE UTERUS AND ITS ANNEXA.

The Uterus is a triangular body, with a truncated apex downward, placed between the bladder and rectum, and with the appearance seen at Figs. 13, *A*, and 14, *B*. In describing it we take up its external appearance, its nature on section, and its structure and relations.

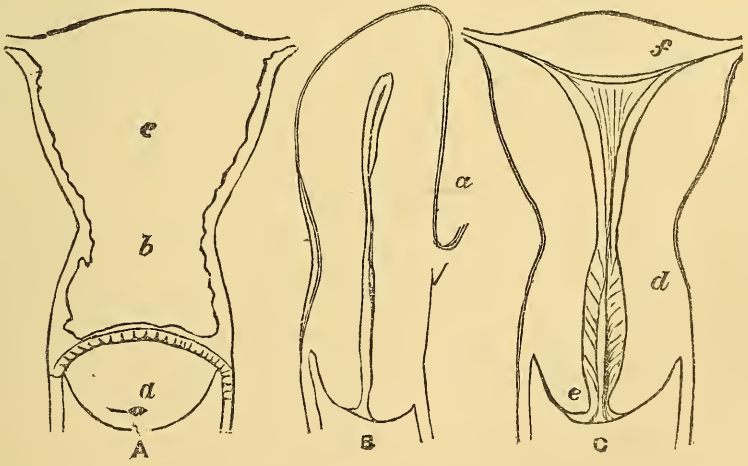


Fig. 13.

A, virgin uterus (front view) (Sappey). The appendages and vagina are cut away. *a*, cervix (vaginal portion); *b*, isthmus; *c*, body; *a*, *b*, cervix proper. *B*. The same, in vertical mesial section. *a* is anterior surface, and lies just above where peritoneum passes on to bladder. *C*. The same, with cavity exposed by coronal section. *e*, os externum; *d*, os internum; *f*, uterine opening of Fallopian tube. (1/1)

On external examination we find the parts known as the body (Fig. 13, *A*, *c*) and neck (Fig. 13, *A*, *a*, *b*). Keeping in mind the description of a

triangle, we see the neck occupying the apex and the uterine orifices of the Fallopian tubes at the two other angles. Between the Fallopian tubes lies the fundus uteri. The anterior surface of the uterus is almost straight; the posterior, convex at its upper part, as is well seen in Fig. 13, *B*. Where the body passes into the cervix there is a slight depression noticed on the posterior surface. This corresponds to the isthmus.

On making a vertical mesial section, we observe that the uterus is a hollow organ possessing a cavity with the anterior and posterior walls in apposition (Fig. 13, *B*). In order to see the cavity it is advisable to look at the uterus in coronal section, *i.e.*, a section which, passing through the

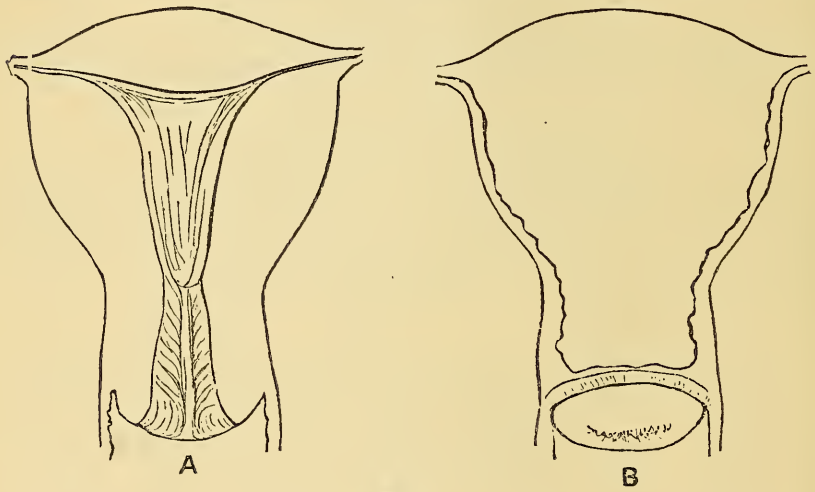


Fig. 14.

A. Multiparous uterus in coronal section to show cavity. *B*. Multiparous uterus from front (Sappey). ($^1/_1$)

cavity, divides the uterus into an anterior and posterior half, as shown in Fig. 13, *C*, Fig. 14, *A*. This latter section enables us more fully to understand the division of the uterus into body proper and cervix, and the division of the uterine cavity into cavity of the body proper and cervical cavity.

Cavity of Body.—This is a triangular slit in the uterus with the apex downwards, and with anterior and posterior walls. At each angle there is an opening, viz., at the lower angle we have the *os internum* opening into the cervical canal (Fig. 13, *C*, *d*), and at the upper angle of the uterine openings of the Fallopian tubes (Fig. 13, *C*, *f*). The lining of the cavity is known as its mucous membrane.

Cavity of Cervical Canal.—This is spindle-shaped or conical (Fig. 13,

B, *C*), and has two openings, viz., os internum above and os externum below. The former opens into the uterine cavity, the latter into the vagina.

The Cervix is divided into two portions, the vaginal and the supra-vaginal portion. The vaginal portion is within the vagina, and appears as a conical mass of the size and shape seen at Fig. 13, *A*, *a*. The os externum is in virgins a mere dimple, and feels to the examining finger like the tip of the nose. In women who have borne children it is transverse (Fig. 14, *B*) and in most cases has its lips fissured more or less deeply, and the mucous membrane of the cervical canal partially everted. The supra-vaginal portion is continuous with the body through the isthmus.

The length of the whole unimpregnated uterus is, speaking generally, about 3 inches; the length of the cavity of cervix and body about 2½ inches.

	Virgin.	Nulliparæ.	Multiparæ.
Length of uterus, . .	2.35 in.	2.50 in.	2.70 in.
Width, ...	1.50 "	1.55 "	1.70 "
Thickness, . . .	0.85 "	0.90 "	1.00 "
			Sappey.
Vertical diameter of cavity,	1.80 "		2.44 in.
Transverse " " .	0.60 "		1.24 "
	("On Cadavera.")		*Richet.*

Length of entire organ in young women, . . 5–6 cm.
Do. body of uterus, . . . 3–3.5 "
Do. cervix, ... 2–3 "
Do. vaginal portion of cervix, . .55–.6 "
Hennig.

Capacity of uterus in nulliparæ = 2–3 c.cm.; in multiparæ 3–5 c.cm.
Sappey.

Various authors divide the cervix uteri more minutely as follows. They consider it as made up of—

a. an infravaginal portion;
b. an intermediate portion;
c. a supravaginal portion. (Fig. 15. *Schroeder.*)

Dr. I. E. Taylor of New York speaks of—

1. The firm and true muscular element belonging to the body of the uterus solely, clearly, and distinctly;

2. The fibro-serous element existing between where the true muscular

structure terminates, and the cervix uteri, the isthmus or intermediate part begins;

3. The glandular structure—the cervix proper.

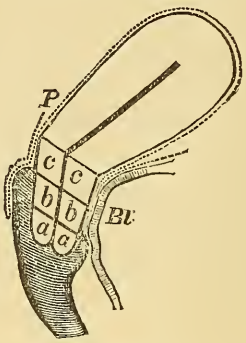


Fig. 15.

Diagram of uterus to show divisions of cervix (Schroeder). *a*, infravaginal portion; *b*, intermediate portion; *c*, supravaginal portion; *Bl*, bladder; *P*, peritoneum. The dotted line shows peritoneum.

These two views are of importance in relation to the causation of prolapsus uteri.

Transverse sections of the uterus at different levels are of different

Fig. 16.

Diagram of section of uterus through centre of cervical canal (Farre). ($^1/_1$)

shapes (Figs. 16, 17, and 18). A consideration of what has been already said will make this clear.

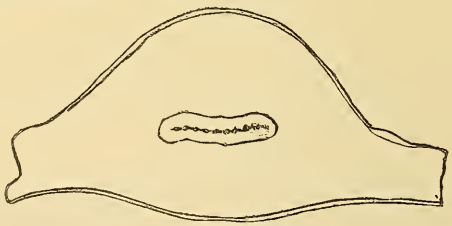


Fig. 17.

Transverse section through centre of cavity (Farre). ($^1/_1$)

Recently the question of the boundary between the canal of the cervix and uterus proper has been raised afresh by Bandl and others in reference

to pregnancy and parturition. Its discussion here, would, however, bring in too much extraneous matter, and is therefore omitted, more especially as the whole question is still *sub lite*.

Structure of the Uterus.—If the uterus be viewed in vertical mesial section it will be seen to be made up of three distinct elements, viz., peritoneum, unstriped muscular fibre, and mucous membrane (Fig. 13, *B*). The peritoneum covers, partially, its external surface ; the mucous membrane lines the cavity of the body and cervix ; while the muscular fibre, by far the largest constituent, forms the tissue lying between these.

The Peritoneum of the Uterus clothes its posterior surface entirely (except the vaginal and middle portions of the cervix) but only dips down on the front surface as far as the isthmus, at which level it is reflected on to the bladder (Fig. 13, *B*, *a*). At the sides of the uterus the peritoneum

Fig. 18.

Transverse section of uterus above Fallopian tubes (Farre). (1/1)

on the anterior and posterior surfaces runs out to the wall of the pelvis, thus forming the important structures known as the broad ligaments.

The *Ligaments* of the uterus are—

Broad ligaments ;
Round ligaments ;
Utero-sacral and Utero-vesical.

The broad ligaments are described under the peritoneum. (See p. 41).

The round ligaments are two in number. According to Rainey, each springs by three fasciculi of tendinous fibres—the inner from the tendons of the internal oblique and transversalis, the middle from the superior column of the external abdominal ring near its upper part, and the outer fasciculus from just above Gimbernat's ligament. These unite into a rounded cord which crosses in front of the deep epigastric artery and passes between the layers of the broad ligament backwards, downwards, and inwards to the anterior and superior part of the uterus. Striped and unstriped muscle, blood-vessels, &c., are found in each.

The utero-sacral ligaments are peritoneal folds, two in number, enclosing connective tissue and unstriped muscular fibre, passing from the lower, lateral part of the body of the uterus outwards and backwards to the second sacral vertebra. They are known as the folds of Douglas, and form part of the upper, lateral boundaries of the pouch of Douglas. They are of the highest importance practically. The peritoneum, as it passes between uterus and bladder, constitutes the utero-vesical ligaments.

The *Musculature of the Unimpregnated Uterus* is of little importance in Gynecology, and needs only a passing notice. Three coats are described: a thin subperitoneal coat passing into the round ligaments, broad ligaments, utero-sacral and utero-vesical ligaments; a middle coat; and an inner concentric and very abundant layer which surrounds the Fallopian tubes, os externum, and os internum. The student should not forget

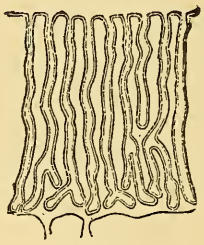


Fig. 19.

Diagram of course of glands of mucous membrane of uterus (Engelmann). ($^{40}/_{1}$)

that the arrangement of the muscular fibres is of the highest importance in practical obstetrics.

The *Mucous Membrane* of the cavity of the body of the uterus is a thin reddish-gray layer, about 1 cm. (.04 inch) thick in the unimpregnated but fully developed organ. It is set on the inner aspect of the muscular layer of the uterus without the intervention of any submucous layer, is made up of ciliated columnar epithelium on a basis of connective tissue and has numerous glands—the utricular glands. On section and microscopic examination, the glands, lined by the ciliated epithelium, can be seen coursing down obliquely from the free surface and ending at the muscular fibre. Fig. 19 shows them perpendicular, but this is less correct, as Turner's diagram indicates (Fig. 20). The glands usually bifurcate at their lower ends, and two may have a common mouth. The innermost layer of muscular fibre sends up prolongations between them—muscularis mucosæ.

The connective tissue in which the glands are embedded consists of delicate round and spindle-shaped cells, the former being more abundant near the surface, the latter deeper. Fibrillated bundles of connective tissue lie also between the cells and pass out between the muscular fibre of the uterine wall (Fig. 20).

The *mucous membrane* lining the cervix is different in arrangement and structure from that lining the cavity of the uterus. It is thrown into numerous folds presenting to the naked eye the appearance known as the

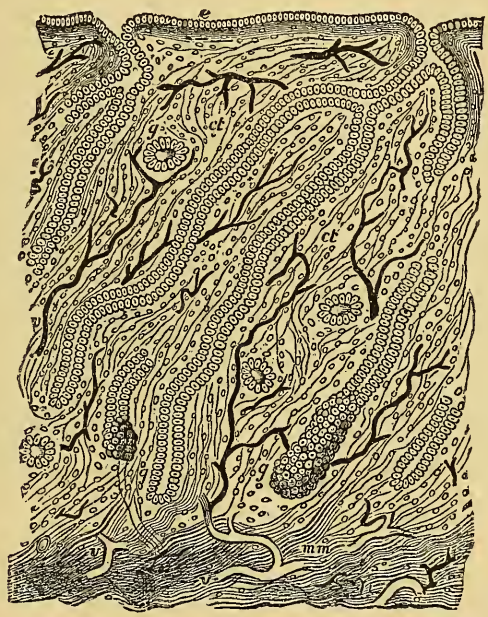


Fig. 20.

Vertical section, through the mucous membrane of the human uterus (Turner). *e*, columnar epithelium, the cilia are not represented; *gg*, utricular glands; *ct*, *ct*, interglandular connective tissue; *vv*, Blood-vessels; *mm*, muscularis mucosæ. (450)

arbor vitæ, which consists of a longitudinal mesial ridge on the anterior and posterior walls, from both sides of which secondary ridges branch off obliquely. It is lined throughout with a single layer of epithelium (Fig. 21) which is ciliated on the elevated portion of the ridges but is columnar in the depressed portions (de Sinéty).

The glands are of the racemose type; and consist of elongated repeatedly branching ducts which extend deeply into the connective tissue and are somewhat dilated at their extremities (Ruge and Veit). They open on the ridges and furrows of the mucous membrane.

There is a sharp line of demarcation between this single layer of epithelium (columnar and ciliated) which lines the cervical canal and the epithelial covering of the external surface of the vaginal portion, and this line of demarcation corresponds in the adult to the os externum. Beyond the os externum the epithelial covering has all the characters of skin; it consists of vascular papillæ covered with many layers of squamous epithelium. The vascular papillæ are not easily recognized without the help of reagents (Ruge and Veit). The epithelial cells are like those found in the skin, and dovetail into one another by denticulate edges (de Sinéty).

It is a disputed question whether glands are present on the vaginal aspect of the normal cervix. De Sinéty says he has never met with them

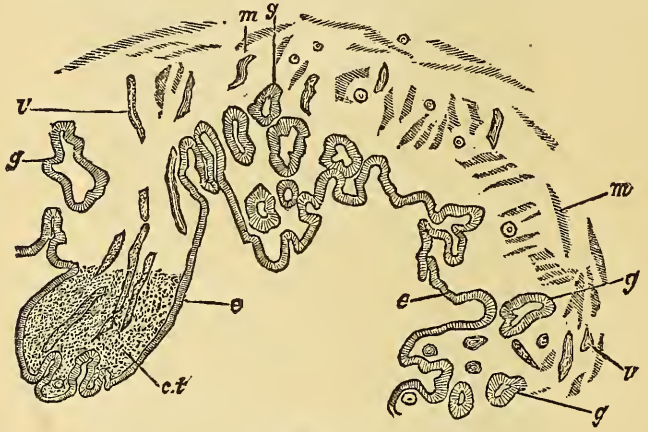


Fig. 21.

Mucous membrane of cervix in microscopical section (de Sinéty). *e*, ciliated columnar epithelium, cilia not shown; *g*, glands; *m*, muscular fibre; *v*, blood-vessels; *ct*, connective tissue shown only at one part of figure. ($^{40}/_{1}$)

except in the neighborhood of the os externum, and their occurrence there he attributes to an aversion of the mucous membrane of the canal. Ruge and Veit also consider the existence of glands as a pathological condition which is however easily induced.

The normal histology of the cervix uteri has an important bearing on the pathology of the so-called ulcerations and on laceration of the cervix and ectropium.

FALLOPIAN TUBES.

The *Fallopian tubes* are two tubes, one on each side of the uterus, running sinuously from its upper angles out towards the side of the pelvis (Figs. 22 and 53). They lie enclosed in the upper free margin of the

broad ligaments, and vary in length from 10 to 16 cm. (3 to 4 inches). They are not of equal length, the right being frequently longer than the left.

After leaving the superior angle of the uterus, the course of the tube is straight for about 2½ centimetres (1 inch). It then curves outwards and forwards, and finally backwards and inwards, so that the whole tube has roughly the shape of a shepherd's crook (Fig. 22). Three parts come up for consideration—the isthmus, the ampulla, and the pavilion or fimbriated end.

The *isthmus* is the straight narrow part of the tube (Fig. 22, *b*), which

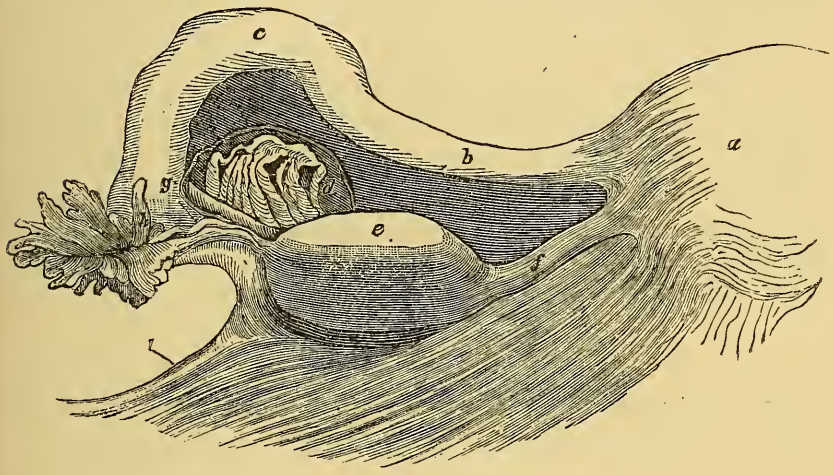


Fig. 22.

View from behind of the lateral angle of the uterus, with part of the left broad ligament, Fallopian tube, ovary, and parovarium (Henle). *a*, uterus; *b*, isthmus of Fallopian tube; *c*, ampulla; *g*, has parovarium to the right, and fimbriated end of Fallopian tube and ovarian fimbria just below it; *e*, ovary; *f*, ovarian ligament; *i*, infundibulo pelvic ligament. (1/1)

at its internal end opens into the uterine cavity, and has a lumen barely admitting a bristle. On transverse section the diameter of the whole thickness is about 2 to 3 mm.

The *ampulla* is the curved and thick part of the tube (Fig. 22, *c*), having an average diameter of about 6–8 mm., with a lumen admitting the ordinary uterine sound.

The free *fimbriated end* of the Fallopian tube (pavilion) is expanded and funnel-shaped; and it is provided with primary and secondary fimbriæ surrounding the opening of the tube to which they converge. One special fimbria runs to the ovary (Fig. 22).

On section the Fallopian tube is seen to be made up of three layers

from without inwards, viz., peritoneal, longitudinal and circular unstriped muscular fibres (the latter being inner), and mucous membrane lined with ciliated columnar epithelium. Connective tissue and elastic fibres lie between the peritoneal and muscular layers. No glands exist in the mucous membrane, which is much folded in a longitudinal direction especially in the ampulla.

It is remarkable that the ciliated epithelium lining the Fallopian tube and pavilion should be continuous with the squamous epithelium of the peritoneum; and that, further, there is direct continuity between the vagina, uterus, Fallopian tubes, and peritoneum,—so that the peritoneal sac in the female is not closed as in the male.

Parovarium or Organ of Rosenmüller.—If the broad ligament be held between the light and the observer's eye, this rudimentary structure will be seen enclosed in its folds in the space between the ovary and ampulla (Fig. 22, *d*). It consists of closed tubules lined with ciliated epithelium, which converge towards the ovary and are united by a longitudinal tube [*v.* under Development]. Their pathological degeneration produces the cystic tumors known as parovarian.

OVARIES.

The ovaries, two in number, lie one on each side of the uterus, projecting markedly through the posterior layer of the broad ligament.

Form, Size, and Relations.—The ovary is a small oval-shaped body about the size of a walnut, the weight of which varies from 60 to 135 grains. According to Farre its measurements are as follows:—

	Longitudinal Diameter.	Transverse Diameter.	Perpendicular Diameter.
Greatest, . . .	2 in.	$1\frac{1}{2}$ in.	$\frac{1}{2}$ in.
Smallest, ...	1 in.	$\frac{1}{2}$ in.	$\frac{1}{4}$ in.
Average, ...	$1\frac{1}{3}$ in.	$\frac{3}{4}$ in.	$\frac{3}{8}$ in.

The ovary has an anterior and posterior border, and an upper and lower surface. The posterior border is convex and free, the anterior flattened and attached to the broad ligament. It should be noted that this anterior border is called the hilus, and that the blood-vessels and nerves enter there.

The position of the ovary will be discussed afterwards (p. 57), but at present it is sufficient to consider it as lying behind the broad ligament

with its posterior border looking backward and its outer end farther back than its uterine one.

Ligaments of the Ovary.—In addition to the attachment which the broad ligament gives to the ovary, two important ligaments are described —the ovarian ligament and the infundibulo-pelvic ligament.

The *Ovarian Ligament* (Fig. 22, *f*) is about 3 cm. (1 inch) long, and extends from the inner end of the ovary to the corresponding upper angle of the uterus, just below the uterine origin of the Fallopian tube. It is a longitudinal fold of the peritoneum into which the unstriped muscular fibre of the uterus is prolonged.

The *Infundibulo-Pelvic ligament* (Fig. 22, *i*) is about 2 cm. long, and runs from the outer end of the Fallopian tube to the side wall of the

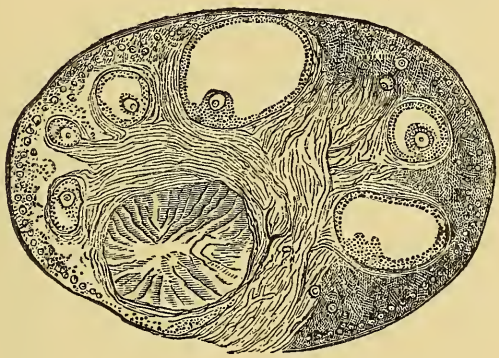


Fig. 23.

Section of cat's ovary (Schrön). The free border of the ovary is, in the figure above, the base of attachment—hilus—below. The division into cortical and medullary layers is indicated. Note smallest Graafian follicles at surface, and larger ones not so superficial. A corpus luteum lies to the left of the hilus. ($^6/_1$)

pelvis. It is simply that part of the upper margin of the broad ligament unoccupied by Fallopian tube.

The *Ovarian Fimbria* (Fig. 22, *i*) prevents the separation of the ovary and infundibulum tubæ. Thus the ovary is kept in position by its attachment to the broad ligament, by the ovarian and by the infundibulo-pelvic ligaments. Its own specific gravity has also a share, *i.e.*, the ovary floats at a certain level.

Structure of the Ovary.—The ovary is covered by epithelium differing from the squamous epithelium of the peritoneum in being made up of columnar cells with a dull lustre. It is continuous, however, with the peritoneal epithelium, the line of contact being marked by a whitish and elevated line. The epithelium covering the ovary is known as the germ-

epithelium. This distinctive term is of importance in connection with the development of the ova and will be more particularly alluded to afterwards.

On section and microscopical examination, the ovary is found to consist of connective tissue with the structures known as the Graafian follicles embedded in it, along with blood-vessels, nerves, lymphatics, and some unstriped muscular fibre. These are enclosed in the epithelial covering already described. The connective tissue is divided into a cortical and medullary layer; the former lying beneath the peritoneum, the latter being at and near the hilus (Fig. 23). The medullary layer is very vascular,

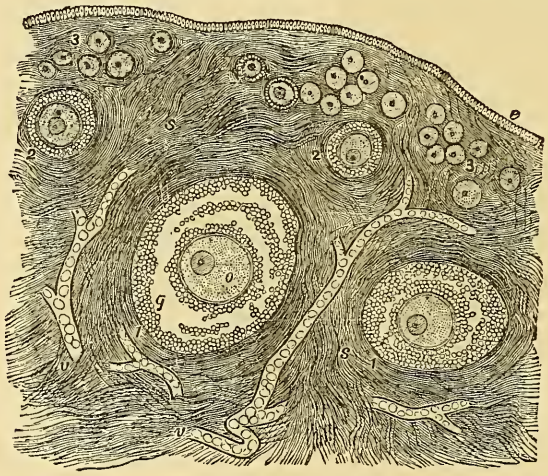


Fig. 24.

Section through the cortical part of the ovary (Turner). *e*, germ epithelium; *s*, *s*, ovarian stroma; 1, 1, large-sized ovarian follicles; 2, 2, middle-sized; and 3, 3, smaller-sized Graafian follicles; *o*, ovum within Graafian follicles; *v*, *v*, blood-vessels in the stroma; *g*, cells of membrana granulosa.

and has some unstriped muscular fibre round the branches of the ovarian artery (Fig. 24).

The Graafian follicles are scattered through the whole substance of the ovary. The following points should be carefully noted:

a. The younger and smaller Graafian follicles lie in the cortical layer. Their size is generally about $\frac{1}{100}$th in., and they exist in immense numbers. According to careful estimates, the ovary of a female infant may contain 40,000 to 70,000 such follicles.

b. The larger follicles are much fewer in number and lie deeper in the ovary. Size $\frac{1}{30}$th to $\frac{1}{100}$th in.

c. There are also still larger follicles nearer the surface than the

latter. These have advanced from the deeper layer (*vide* under Menstruation).

Structure of a Graafian Follicle.—This consists of

1. An envelope of connective tissue with capillary vessels;
2. The Membrana granulosa, a layer of nucleated columnar epithelial cells forming the discus proligerus at one part;
3. Fluid.

The ovum (size $\frac{1}{100}$ to $\frac{1}{130}$ in. diameter) lies in the discus proligerus; it has

1. External envelope—zona pellucida,
2. Yelk protoplasm,
3. Germinal vesicle ($\frac{1}{700}$th in. diameter),
4. Germinal spot $\frac{1}{3000}$th in. diameter.

THE VAGINA.

The vagina is a mucous slit in the pelvic floor, extending from the hymen to the cervix uteri, and lying between the urethra and bladder in

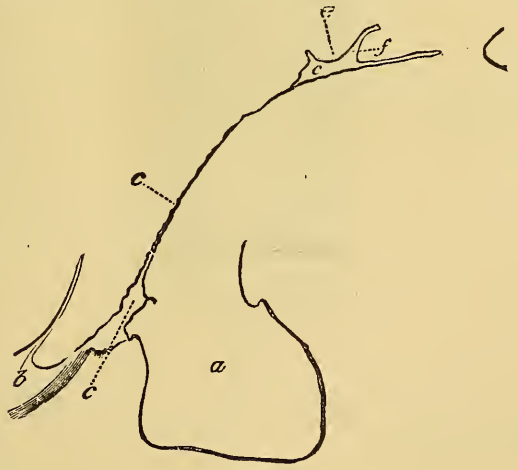


Fig. 25.

Life-size drawing of vagina in vertical section (Hart). *a*, perineum; *b*, urethra; *c*, vagina; *e*, anterior lip of cervix; *f*, os uteri. The axis is not normal in its upper part, as the uterus was drawn back. ($^1/_1$)

front and the rectum behind. In the upright posture it makes an angle of about 60° with the horizon, *i.e.*, it is nearly parallel to the pelvic brim.

The vagina has two walls, an anterior and posterior, which are continuous at their sides. The anterior vaginal wall is triangular in shape,

the base being above. Its lower limit is marked out by the hymen. At its upper end it is reflected down to a very small extent on the anterior lip of the cervix uteri, the anterior fornix being thus formed (Fig. 25). It is closely incorporated with the urethra, but between it and the posterior aspect of the bladder there is loose connective tissue. Its length is about 5 cm., *i.e.*, 2–2½ inches.

The mucous membrane of the wall is arranged in folds roughly transverse. At its lower end is a vertical mesial single or double thickening

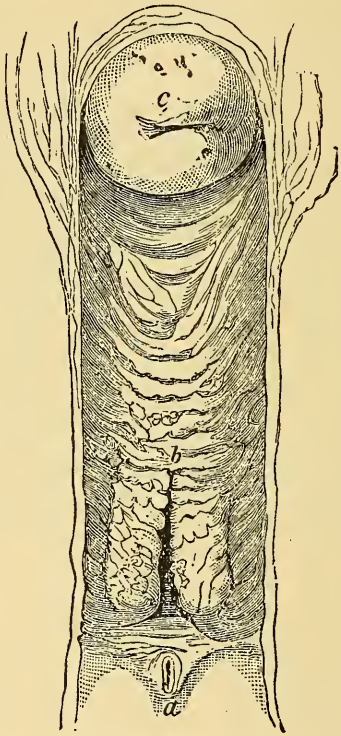


Fig. 26.

Anterior vaginal wall and multiparous cervix, looked at from behind (Henle). *a*, urethral orifice; *b*, anterior vaginal column; *c*, cervix uteri. (1/1)

of the mucous membrane, about 2 cm. long, known as the anterior vaginal column (Fig. 26, *b*). This begins near the urethral orifice or about 1½ cm. above it. According to Budin, the columns are prolonged on the hymen.

The posterior vaginal wall is triangular in shape and extends from the vaginal orifice upwards to the cervix uteri upon which it is reflected, thus forming the posterior fornix vaginæ, which is deeper than the anterior

one. Its length is about 7½ cm. (3 inches), *i.e.*, about 2½ cm. (nearly 1 inch) longer than the anterior. It is also transversely rugous, and has a posterior column analogous to the anterior, but smaller.

While the direction of the anterior vaginal wall is almost straight, that of the posterior vaginal wall is sigmoid (Fig. 27). The curve varies, however, according to the position of the uterus, and the fulness or emptiness of the adjacent bladder and rectum.

When the bladder and rectum are empty we find the direction of the vagina parallel to the pelvic brim. When the bladder is distended the

Fig. 27.

Diagram of vertical mesial section of female pelvis, showing sigmoid curve of posterior vaginal wall (Schultze). (1/4)

vagina is, chiefly at its upper part, driven nearer the sacrum; while if the rectum be distended, the vaginal axis may be almost perpendicular.

Structure of Vagina.—The vaginal wall on section and microscopical examination is found to consist of mucous membrane, made up of epithelium (the superficial layer being squamous and nucleated, the deeper layer cylindrical and with elongated nuclei); of connective tissue, elastic tissue, and some unstriped muscular fibre. External to this lie two layers of unstriped muscular fibre; the inner longitudinal, the outer

circular (Henle). Breisky alleges the inner to be circular. There are no proper glands in the vagina, but gland-like crypts and lymph follicles exist (Löwenstein) (Fig. 29). The whole is surrounded by loose connective tissue (Fig. 29).

As already stated, the vagina is a mere slit in the pelvic floor, although

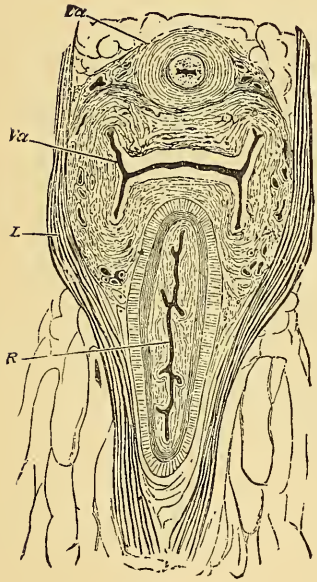


Fig. 28.

Horizontal section of the pelvic floor at the pelvic outlet (Henle). *Ua*, urethra; *Va*, vagina; *R*, rectum; *L*, levator ani.

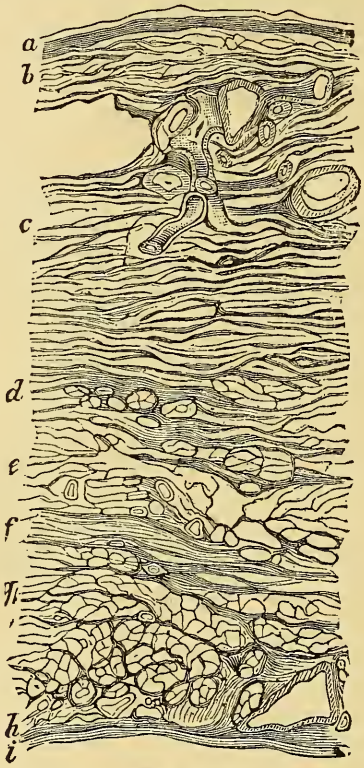


Fig. 29.

Horizontal section of the posterior wall of bladder and the anterior wall of the vagina (Henle). ($^{15}/_{1}$) *a*, epithelium of the bladder; *b*, mucosa; *c*, layer of circular fibres; *d*, layer of longitudinal fibres; *e*, loose tissue; *f*, layer of circular fibres; *g*, layer of longitudinal fibres; *h*, mucosa; *i*, epithelium of vagina.

it is often erroneously described as a tube or cavity. On vertical section, as Fig. 25 shows, it appears as a mere linear slit; while on transverse section it is H-shaped, or crescentic (Figs. 28 and 46). Of course the vagina is eminently dilatable and its walls separable, as will be more fully considered under the structural anatomy of the pelvic floor, but this dilatation or separation is the result of posture with manipulation, or of

Parturition. Whatever posture a woman may assume, the vagina on section is slit-like, unless in certain exceptional instances.

THE BLADDER.

Position.—The empty female bladder lies behind the pubis and in front of the vagina, and consists of the urethra and bladder proper.

The urethra is a straight slit (some describe it as sigmoid) about $1\frac{3}{8}$ inches long, with thick walls closely incorporated with the anterior vaginal wall behind. It runs parallel to the plane of the pelvic brim. Its

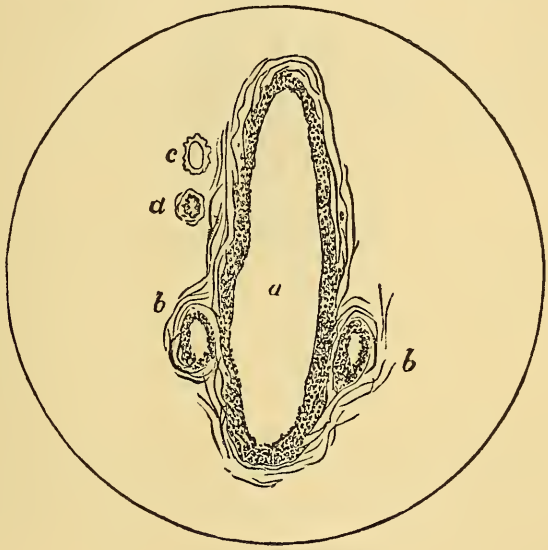


Fig. 30

Transverse section of urethra much enlarged (Skene). *a*, urethra; *b*, *b*, glands described by Skene; c, vein; *d*, artery.

lower opening is known as the meatus urinarius, the position of which has been already considered in the section on the External Genitals; its upper opening is at the neck of the bladder. On section and microscopical examination, its mucous membrane is found covered with squamous epithelium in its lower part; while higher up it is like that of the bladder, and is very rich in elastic fibres. There is a double layer of *unstriped* muscular fibre, the longitudinal layer being internal and the circular outside; and, according to Uffelman, a circular (inner) and longitudinal layer of *striped* muscle, which stretches from the neck of the bladder to within $1\frac{1}{2}$ cm. of the meatus urinarius. Luschka also describes a special sphinc-

ter of the vaginæ and urethral orifices. It should be further noted that the mucous membrane is folded longitudinally and contains mucous glands lined with cylindrical epithelium, papillæ and lacunæ, and also villous tufts near the meatus; and that there is a submucous layer between the mucous membrane and unstriped muscle, containing many veins. Recently Skene, of New York, has described two tubules in the female urethra. They lie on each side "near the floor of the female urethra, and extend up from the meatus urinarius for about ¾ inch (Figs. 30 and 31).

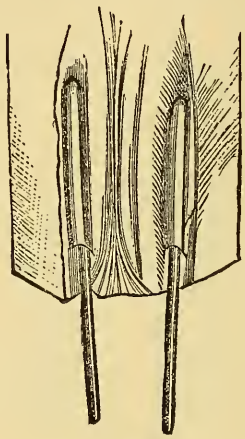


Fig. 31.

Urethra laid open from above, showing glands with probes passed in (Skene).

They lie beneath the mucous membrane, and in the muscular walls of the urethra." We have in section of the female urethra :—

mucous membrane;
submucous layer;
muscular layer, longitudinal and circular, unstriped;
do. do. striped (Uffelman).

External to these there is the anterior vaginal wall behind, and loose tissue in front.

According to Henle, the closed urethral slit is on section transverse near the bladder, sagittal at the meatus, and star-shaped between these two points.

In the bladder proper we have three openings, the internal orifice of the urethra and the orifices of the two ureters. The latter lie one on each side, about 1½ inches from the internal orifice. These openings give us the landmarks for the division of the bladder into neck, base, and body.

All above the lines joining the ureteric openings and the centre of the symphysis is the body; all below is the base, and that portion between the ureteric openings and the internal orifice is the trigone. Just above the ureters is the *bas fond* (Skene).

The wall of the bladder is made up of three layers, *viz.*, a mucous, a muscular, and a peritoneal.

The mucous membrane consists of connective tissue lined by several layers of transitional or multiform epithelium (Fig. 32). It is arranged in

Fig. 32.

Epithelial cells from the mucous membrane of the bladder. Those in the upper row are the superficial squamous cells; those in the lower row are the peculiar cells of the middle stratum (Turner).

folds, except over the trigone and openings. The folds or rugæ are due to the laxity of the submucous coat.

The muscular coat of the bladder is of the unstriped variety, and has a complicated arrangement. There are external longitudinal fibres, circular fibres within these, and an internal longitudinal layer on which rests the submucous coat. It is disputed whether there is a sphincter at the neck of the bladder. Probably there is not; but the puckering of the mucous membrane at the neck is alleged to have a valve-like function.

The peritoneal covering of the bladder will be considered subsequently.

The relation of the ureters to the bladder is of importance. Garrigues has recently investigated this subject, owing to its importance in Gastro-Elytrotomy.

"In this obstetric operation, employed in cases where craniotomy or the cæsarean section is the alternative, the operator cuts through the abdominal walls with the same incision as that for ligature of the external iliac artery. The peritoneum is pushed aside and the vagina partly cut and partly torn by an oblique incision. The child is then extracted. In some of the cases the bladder or ureter has been torn into."

According to him "the ureter does not lie in the broad ligaments, it does not keep the same direction on reaching the wall of the bladder, and it does *not* lie close up to the wall of the cervix, all of which is taught by anatomical authorities. After having crossed the iliac vessels the ureters diverge, running downward, backward, and a little outward on the wall of the pelvis, behind the broad ligaments to a point near the *spina ischii.* Then they bend downward, forward, and considerably inward so as to converge toward the bladder. They pass beneath the base of the broad ligament, lying in the abundant cellular tissue found in this locality. They

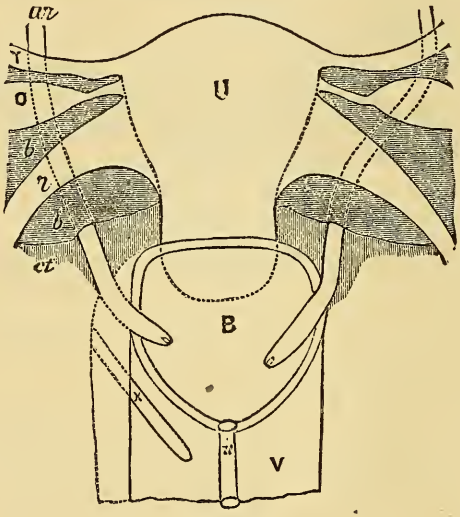


Fig. 33.

Relations of ureters (Garrigues). *U*, uterus; *ur*, ureter; *B*, bladder; *u*, urethra; *V*, vagina; *T*, Fallopian tube; *O*, ovary; *b*, broad ligament; *r*, round ligament; *ct*, connective tissue: *x*, incision of vagina in gastro-elytrotomy. (2/3)

cross the cervix at some distance from behind, at an acute angle, so as to come in front of and below it. They lie outside and above the anterior part of the side wall of the vagina, on a spot as large as the tip of the finger. On reaching the wall of the bladder they turn rather sharply inward and go less downward until they open with a small slit into the interior of the bladder at the outer angle of the *trigonum vesicæ.* But on dissecting the bladder from the uterus and vagina, their substance is seen to continue running as a solid ridge between the two apertures, and forming the base of the trigone (Jurie's inter-ureteric ligament)." (See Fig. 33.)

Shape of empty Bladder and Changes in its Position.—The empty female bladder lies completely behind the pubis, and has its fundus covered by

peritoneum. When empty and viewed in mesial section it may present one of two shapes. In the large majority of specimens figured, it forms with the urethra a Y shape on sagittal mesial section. The oblique legs of the Y may be about equal in size, or the posterior may be shorter (Figs. 40, 34). This form is so common that it has been accepted hitherto by all authors as the normal one. In certain cases, however, insignificant in

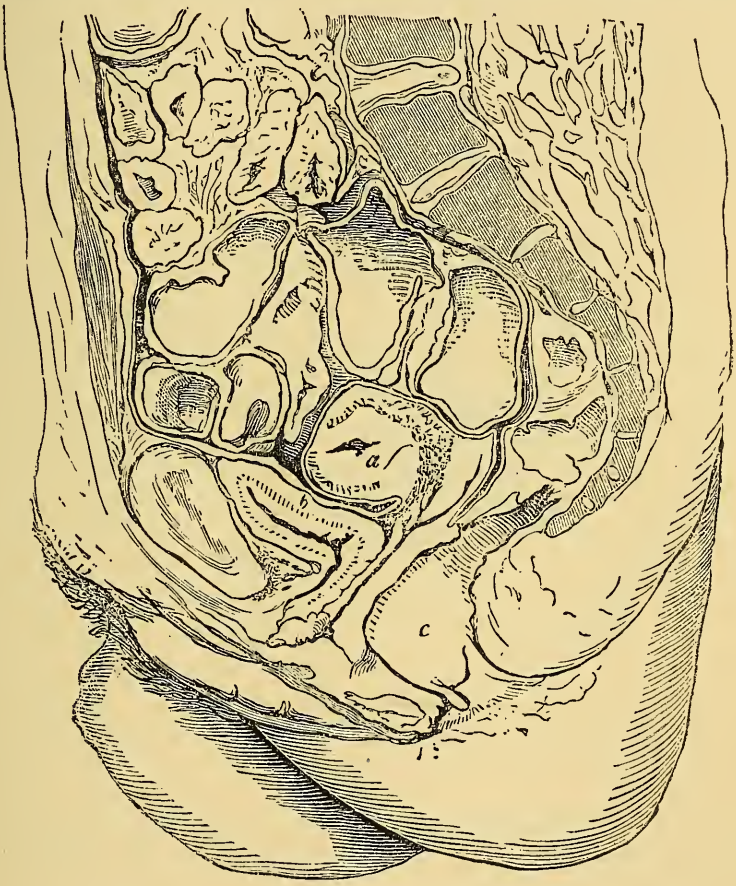


Fig. 34.

Vertical mesial section of female pelvis, showing Y shape of bladder (Fürst). (1/2)

number as compared with the former, the empty bladder cavity forms with the urethra a continuous tube on vertical mesial section (Fig. 35). In such cases it is oval in shape, corrugated, and firm to the touch. This latter shape is the one always found in the lower animals, such as the rabbit and dog, and is the only one seen in the human fœtus. If, therefore, the pelvic floor of a woman be viewed on its peritoneal aspect, the fundus of

the empty bladder will be found to be almost always large and concave, while in a few cases it is small and convex. In the former case, the inner surface of the upper segment of the bladder, large in area, is in contact with the surface of the lower segment; in the latter, the anterior and posterior inner walls, small in area, touch one another.

It is probable that when the bladder has the Y shape on section, it is in diastole (Fig. 34); and when the oval shape (Fig. 35), it has been caught in systole. The bladder contracts to expel the urine and then relaxes. Between the acts of urination the bladder is therefore only a flaccid sac. Some additional facts as to the position and distention of the bladder are best considered further on, under the structural anatomy of the pelvic floor. We may here state, however, that (1) when empty, in the non-par-

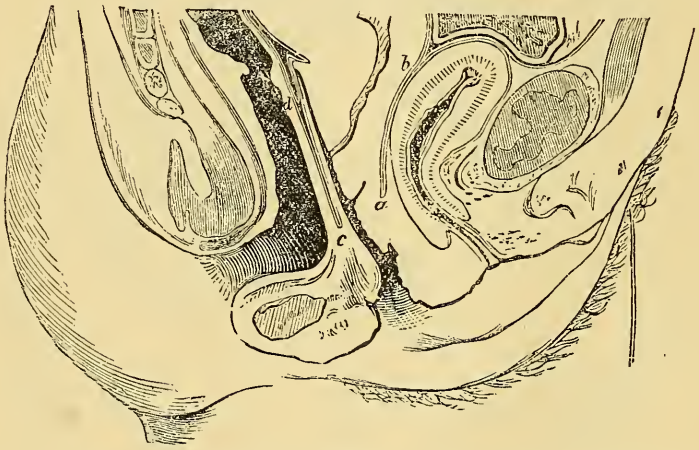


Fig. 35.

Vertical mesial section of female pelvic floor, showing contracted bladder in a suicide (Braune). (1/2) The peritoneum descends in front of the uterus to *b* and behind it to *d*; *b a* and *d c* are loose extra-peritoneal tissue.

turient female, it is behind the pubis (Fig. 32); (2) it is drawn above the pubis in the parturient female; (3) it is tilted above the pubis in retroversion of the gravid uterus.

The so-called ligaments of the bladder are false and true. The false are formed of peritoneum and will be considered under the peritoneum of the pelvic floor. The true ligaments are formed of the pelvic fascia.

RECTUM.

The *Rectum* extends from the left sacro-iliac synchondrosis, where the sigmoid flexure of the colon terminates, to the anus. It curves downwards,

backwards, and inwards, to about the third sacral vertebra. This is known as the first part of the rectum; it is completely covered by peritoneum, which forms the meso-rectum. The peritoneum is reflected from the rectum on to the upper part of the vaginal wall, about 3 inches above the vaginal orifice. Thereafter, the rectum lies in relation anteriorly to the posterior vaginal wall to which it is loosely attached until about 1½ inches from the anus.

The rectum is made up of peritoneal investment; unstriped muscular

Fig. 36.

Rectum inflated (Chadwick). *a b*, sphincter tertius; *c*, ampulla of rectum.

fibre in two layers, longitudinal and circular, the former being the outer; a submucous coat; and a mucous lining with its musculares mucosæ, columnar epithelium, no villi, but with Lieberkuhnian follicles closely set together. At the upper limit of the anus, the circular fibres are very well marked and constitute the sphincter ani internus (Fig. 37).

Certain oblique folds in the rectum—consisting of mucous, submucous, and circular unstriped muscular coats—are of special interest. One exists 1½ inches from the anus, another is near the sacral promontory, and one is intermediate (Turner). The lowest (the valve of Houston or sphincter ani tertius of Hyrtl) has been described by Chadwick of Boston,

as being not an entire circular fold but made up of two semicircular constrictions, one on the anterior wall and one on the posterior an inch higher up (Fig. 36).

The *Anus* is that part of the rectum at its external orifice. It is about

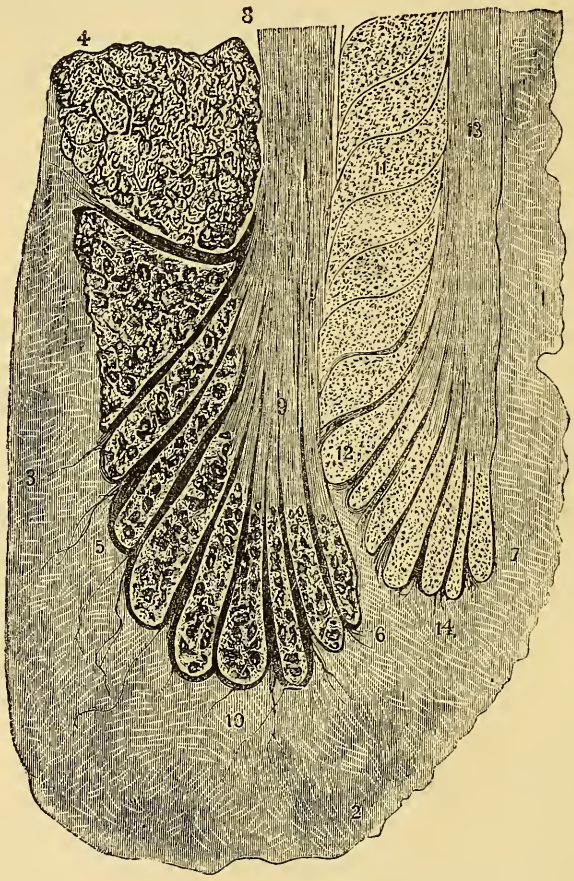


Fig. 37.

Perpendicular section through the end of the rectum enlarged (Ruedinger). 1, mucous membrane of the rectum: 2, boundary between mucous membrane and skin of buttock; 3, fat; 4, levator ani; 5, sphincter ani externus; 9, fibres of longitudinal layer separating external sphincter into parts; 7, sphincter ani internus; 8, longitudinal fibres of muscular coat, which radiate outwards at 9; 13, longitudinal fibres of muscularis mucosæ which radiate outwards at 12; 11 circular fibres of muscular coat; 6, 10, and 14, slips of muscular fibre passing into tissue beyond.

an inch long, and has its long axis directed backwards and cutting the axis of the vagina at about a right angle. The rectum, therefore, when in contact with the posterior vaginal wall, closely follows its direction, but at about 1 inch from the anus turns sharply backwards. There is thus left

between it and the last 1½ inch or so of the posterior vaginal wall, an angular interspace to be filled up by the structure known as the perineal body.

Fig. 37, from Ruedinger, shows the arrangement of the voluntary and involuntary muscle of the anus. The division of the external sphincter into two parts, and the separation of the lower division (5) into compartments by fibres from the longitudinal unstriped layer (9), are noteworthy. Similarly the internal sphincter (7) is divided into compartments by fibres from the muscularis mucosæ (13). Near the anal orifice the mucous membrane has certain perpendicular folds in it known as the Columnæ Morgagni, with depressions between these—the Sinus Morgagni (Fig. 2).

PERINEAL BODY.

The posterior vaginal wall is in contact with the anterior rectal wall, for about 1½ inches above the apex of the perineal body, there being only loose tissue between. The anus has its long axis directed backwards, while the vaginal axis runs forwards; we thus get a pyramidal space filled up by the structure known as the Perineal body (Henle and Savage).

The Perineal body is made up of muscular insertions and origins (striped and unstriped), and fibrous and elastic tissue. Its base is covered by the skin lying between the anus and vagina; its anterior side is behind the posterior vaginal wall; its posterior side lies in front of the anterior rectal wall and anus; while laterally, it is bounded by fat. The voluntary muscles passing into it are the Sphincter-ani, Transversus perinei, Bulbo-cavernosus, and Levator-ani (Fig. 2).

This Perineal body measures about 1½ inches (4 cm.) vertically, the same transversely, and ¾ in. antero-posteriorly. If a straight line be made to join the tip of the coccyx and the subpubic ligament, it will just clear the apex of this structure.

Its functions are important, but have been both exaggerated and underrated. It gives a fixed point for many muscles, prevents pouching of the rectum forwards, and strengthens that part of the pelvic floor which has no posterior bony support.

Its special significance, however, will be considered further on.

At present, the nomenclature in regard to the "Perineal region" is exceedingly vague; as the term Perineum is used in varying senses by accoucheurs, especially in regard to the tears caused by Parturition. It is

better to be precise, and speak of tears of the hymen, fourchette, and perineal body, instead of saying "perineal tears." The surface between the anal and vaginal orifices is not the perineum, but the "skin over the base of the perineal body" and "the fourchette."

PERITONEUM.

This is the thin serous covering of the concave surface of the pelvic floor, uterus, and its appendages, etc. A knowledge of its disposition is

Fig. 38.

Frozen section showing peritoneum (Fürst). The dotted line indicates peritoneum in this and Figs. 36–44. *a*, anus; *b*, vagina; *c*, bladder; *d*, uterus; *e*, below pouch of Douglas. Symphysis pubis. (1/2)

of the highest importance to the Gynecologist. This is best considered as follows.

1. *The Pelvic Peritoneum as followed in the Vertical Mesial Line.*—The

Peritoneum of the anterior abdominal wall is reflected, at a point a little above the symphysis pubis, on to the fundus of the empty bladder (Figs. 38 and 39). It passes downwards over the posterior surface of the bladder, from which it crosses on to the anterior surface of the uterus at a point about the level of the os internum. From this it passes up over the anterior surface of the uterus. Thus there is formed a vesico-uterine pouch, containing no small intestine either when the bladder is in systole or in

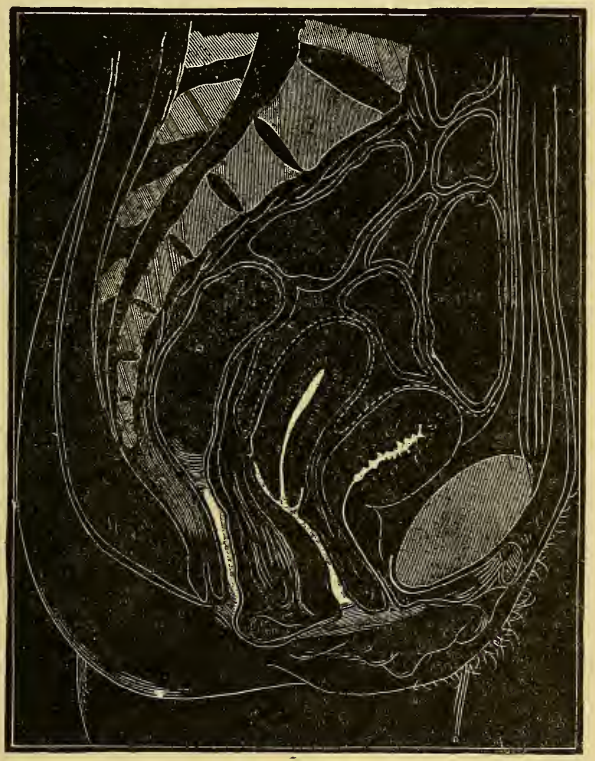


Fig. 39.

Frozen section showing peritoneum in contracted bladder (Heitzmann).

diastole (Figs. 38 and 39). When the bladder has the Y-shape pathologically produced [*vide* postea], the peritoneum passes directly backwards across the fundus of the bladder and on to the anterior surface of the uterus at or below the level of the os internum (Fig. 40). There is thus produced a utero-abdominal pouch (Fig. 40).

The peritoneum covers the whole of the anterior surface of the uterus above the os internum, passes over the fundus and down the posterior surface, which it covers almost completely. From this it descends still

deeper, on to the posterior aspect of the posterior vaginal wall for about one inch (Fig. 38). The amount of its dip varies, however. In one section by Pirogoff (Fig. 41) the peritoneum runs down on the posterior vaginal wall till within about an inch from the vaginal orifice. This extent of posterior peritoneal duplicature is, of course, abnormal. The depth of the peritoneal pouch behind the uterus is greater on the left side than on the right. That its depth varies is quite evident on section, as in some sections it ends at the level of the posterior fornix (Fig. 39), while

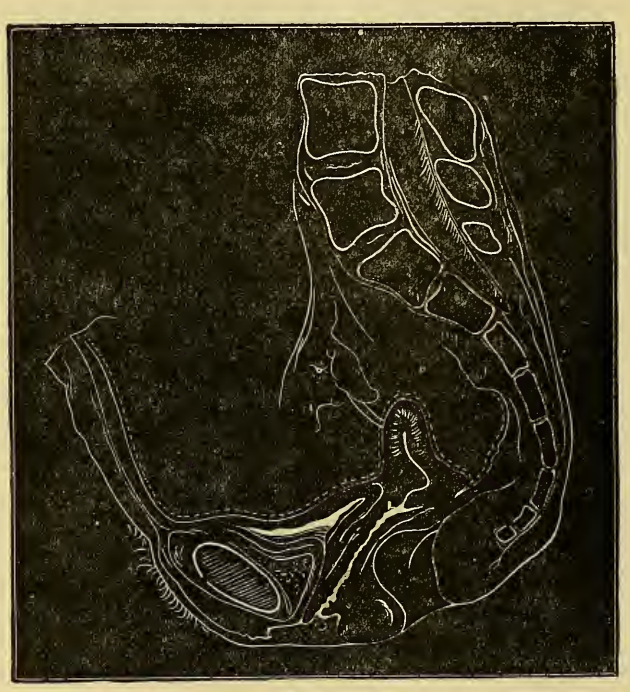


Fig. 40.

Section (spirit-hardened) showing peritoneum when uterus is drawn back by posterior pelvic cellulitis (Hart).

in others it is seen passing as deeply as has been already described (Figs. 38, 41). This descent of the peritoneum behind the uterus is of the highest importance practically, and forms the well-known pouch of Douglas. This pouch is best defined as follows:—Its upper lateral boundaries are the utero-sacral ligaments; its anterior boundary is the uppermost inch of the posterior vaginal wall and posterior aspect of the supra-vaginal portion of cervix; its posterior boundary is the sacrum and rectum, covered by peritoneum. It is the lowest part of the peritoneal cavity, and from its relation to the posterior vaginal wall can be explored through the

posterior vaginal fornix. It is partially filled by intestine when the uterus lies to the front, which becomes displaced when the uterus is retroverted or retroflected.

2. *The Disposition of the Pelvic Peritoneum at the sides of the Uterus. The Broad Ligaments.*—At the sides of the uterus, the peritoneum clothing its anterior and posterior surfaces, passes outwards and somewhat back-

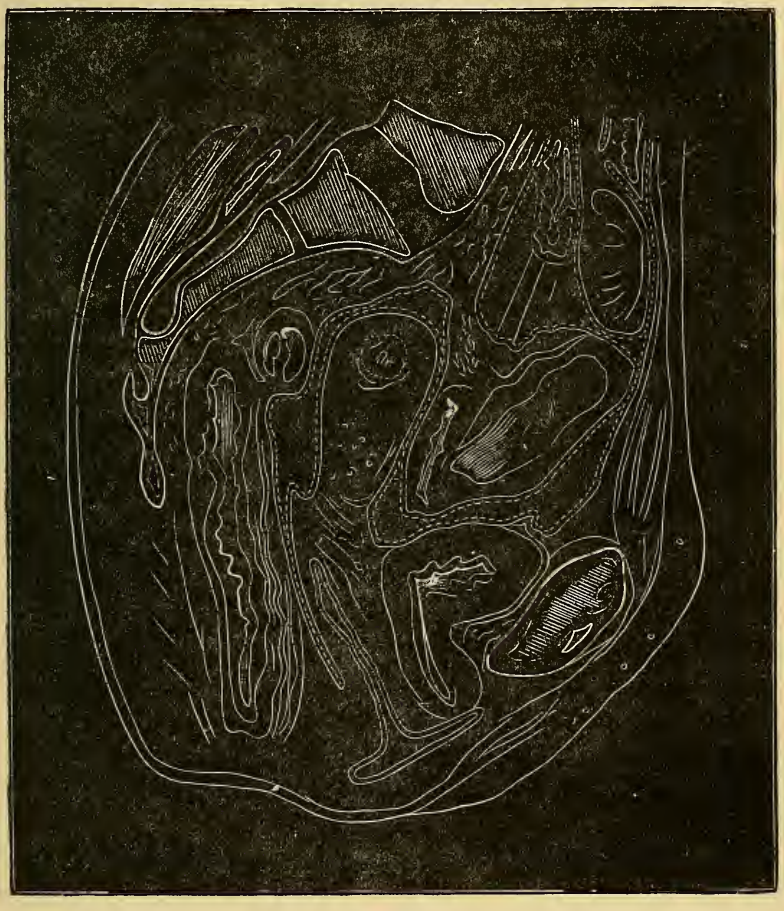


Fig. 41.

Peritoneum dipping abnormally deep between rectum and vagina (Pirogoff).

wards to the sides of the pelvis in front of the sacro-iliac synchondrosis. In this way we get two laminæ of peritoneum nearly in apposition, which become more separated at their junction with the pelvic floor and sides of the pelvis. These are the broad ligaments of the uterus.

Just within their upper free margin the Fallopian tubes are placed.

That part of the free margin not occupied by the Fallopian tube forms the infundibulo-pelvic ligament of the ovary (Figs. 22 and 53). Projecting through the posterior lamina of the broad ligament is the ovary, covered by its germ-epithelium. The ovarian ligament and parovarium have already been described under the ovary and Fallopian tube.

Between the layers of the broad ligament lie connective tissue, unstriped muscle, blood-vessels, and lymphatics. According to M. Guerin, the broad ligaments enclose a small space shut off from the rest of the cellular tissue of the pelvis, and he denies that as yet there is proof of any special diagnosable inflammatory affection of the broad ligaments.

Fig. 42.

Relation of peritoneum to bladder at end of pregnancy (Braune). (Frozen.) *a*, vaginal entrance; *b*, uterus; c, anus; *d*, bladder; *e*, symphysis.

Guerin alleges that, by inflation, it can be demonstrated that the broad ligaments are thus shut off—a fact denied by other observers.

The position of the broad ligaments varies according to that of the uterus. When the uterus is normal in position, *i.e.*, lying to the front, their posterior surfaces look upwards and somewhat backwards, and they run outwards and backwards as already described. Displacement of the uterus backwards causes their coincident displacement, and in pregnancy they are drawn up and lie almost vertically. Pathologically, they cicatrize after inflammatory attacks causing unilateral deviations of the uterus.

3. *The Pelvic Peritoneum on the Side-walls of the Pelvis.*—The Pelvic

peritoneum clothes the side-walls of the Pelvis. It dips down least at the side of the bladder and most at the utero-sacral ligaments.

Although the Pelvic Peritoneum has been described in three sections, it must of course be kept in mind that it is a continuous membrane, with no breaks in its continuity.

Some special facts about the peritoneum should now be noted.

1. *As to the Bladder.*—When the bladder is distended, the peritoneum is stripped off the lower part of the anterior abdominal wall to an extent varying with the distention (Fig. 44). During parturition, the Peritoneum is drawn off the bladder (Fig. 43) (Hart).

2. *As to the Rectum.*—Its upper part is completely invested by peri-

Fig. 43.

Relation of peritoneum to bladder during parturition (Braune). *a*, vagina; *d*, bladder; *c*, anus.

toneum; the second part is only partially covered, *i.e.*, the peritoneum gradually leaves the rectum, quitting first the posterior surface, then the sides, and finally passing from the anterior surface on to the posterior vaginal wall as already described.

Over the bladder and anterior abdominal wall the peritoneum is easily separable. According to Spiegelberg, above the os internum uteri posteriorly it is closely blended with the uterus, below this quite loosely.

Practical Points.—In no operative procedure involving the anterior vaginal wall can the peritoneal cavity be opened into. In the upper third or so of the posterior vaginal wall the peritoneum may be opened into. This has indeed been done by the most skilful operators, but the risks at-

tending it are not so considerable as usually alleged, especially when drainage-tubes are employed. When the fingers are passed into the pos-

Fig. 44.

Relation of bladder and peritoneum when bladder is distended (Pirogoff). *a*, vagina; *b*, uterus; *c*, anus; *d*, bladder; *e*, symphysis.

terior fornix vaginæ, only about $\frac{1}{3}$ inch of tissue intervenes between them and the peritoneum. The possibility of there being a deep dip of the peritoneum, as shown at Fig. 41, should not be forgotten.

CONNECTIVE TISSUE OF PELVIS.

By this we understand (I.) the Fascia described so elaborately by the human anatomist as the Pelvic Fascia; and (II.) the loose Connective Tissue padding the interstices between the muscles, lying round the cervix uteri and spreading out beneath the Pelvic Peritoneum.

I. The *Pelvic Fascia* of the anatomist is carefully described in the ordinary systematic and dissecting-room manuals, to which the student is therefore referred.

II. The loose connective tissue found lying subperitoneally, surrounding the cervix uteri and spreading out between the layers of the broad ligament, is of the highest importance pathologically, as in it and in the pelvic peritoneum occur those inflammatory exudations so common in women. Of late years our knowledge of the disposition of this tissue has been rendered much more accurate, and accordingly our discrimination of pelvic inflammatory attacks made much more precise.

The distribution and relations of the pelvic connective tissue may be studied in various ways. The most valuable information is obtained by considering sections of frozen or spirit-hardened pelves. This gives the precise position of the tissue, its amount, and distribution. The sections are made in various directions: antero-posteriorly, in the middle line (sagittal mesial); antero-posteriorly, at the junction of the broad ligaments and uterus (lateral sagittal); horizontally, at various levels; and finally, coronally, *i.e.*, parallel to the coronal suture and dividing the pelvis into anterior and posterior portions. Another valuable method of investigation is to inject air beneath the peritoneum, between the layers of the broad ligament and at other points. By this we learn the varying attachments of the pelvic peritoneum to the subjacent tissue, and the lines of cleavage, as it were, of the pelvic connective tissue along which pus will burrow.

Instead of air we may inject plaster of Paris or water; plaster of Paris will be found the most useful. We therefore consider—

a. Results obtained by section.

b. Results obtained by the injection of water, air, plaster of Paris.

a. Results obtained by Section.

1. *Vertical Mesial Section.*—This shows a large amount of loose tissue lying between the posterior aspect of the symphysis pubis and the angle formed by the urethra and anterior wall of bladder—the retro-pubic fat deposit (Hart). It is a matter of some importance to note its shape when the bladder is empty and the female in the dorsal posture. It is then distinctly triangular. Between the sacrum and rectum, between the posterior wall of the bladder and the uterus, and between the supra-vaginal portion of the cervix and posterior vaginal wall, connective tissue in comparatively small amount is distributed (Figs. 34, 39). Note specially that loose tissue separates the posterior vaginal wall from the anterior rectal wall as far as the apex of the perineal body where they are closely blended (Fig. 35); that the urethra and anterior vaginal wall have no such loose tissue intervening, *i.e.*, are closely united; while, as already stated, the anterior vaginal wall and posterior aspect of bladder are separated by tissue.

2. *Lateral Sagittal Section.*—By this section a specially valuable view is obtained. Fig. 45 shows an accurate drawing of such a section, just at the

junction of the uterus and broad ligaments. It should be noted that the amount of retropubic tissue is less than in the sagittal mesial one ; that at the junction of the broad ligaments with the uterus there is a large amount of tissue with large blood-vessels ; and specially that the finger placed in the lateral fornix vaginæ touches the base of the broad ligament there. This fact is valuable as to diagnosis. On section, the boundaries of the

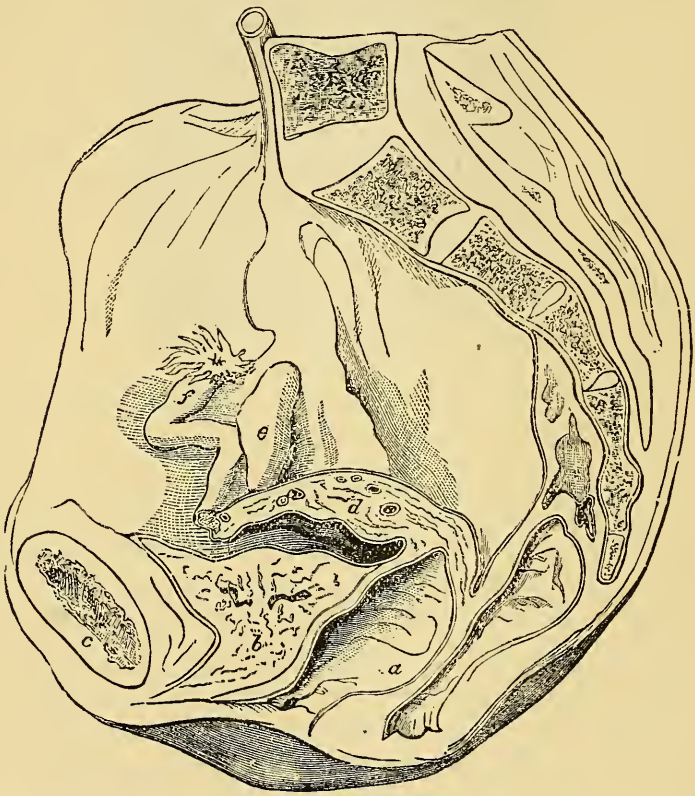


Fig. 45.

Lateral sagittal section of pelvis at junction of broad ligament and uterus. *a*, vagina with its walls separated ; *b*, bladder ; *c*, symphysis ; *d*, broad ligament ; *e*, ovary ; *f*, Fallopian tube.

space between the broad ligaments are seen ; superiorly the cut section of the Fallopian tube, anteriorly and posteriorly the peritoneum, and inferiorly the vaginal fornix. The assertion by Guerin and Le Bec as to the insignificance of the tissue here is not borne out.

Sections made nearer the side pelvic wall display specially the lessening tissue between the layers of the broad ligaments and show sections of the ovary.

3. *Horizontal sections* give results confirming those above stated. It is unfortunate that no good sections are as yet published. Pirogoff gives several, but these are not clearly defined in their connective tissue relations. Freund has published an admirable description of his preparations, but it is to be regretted that he has not figured them. The most valuable sections are those at the level of the supravaginal portion of the cervix, which show the tissue lying here all round it. At Fig. 46 we show a section from Ruedinger where the retropubic fat and ischiorectal cavities are well shown.

This is the best place to draw special attention to what Virchow first

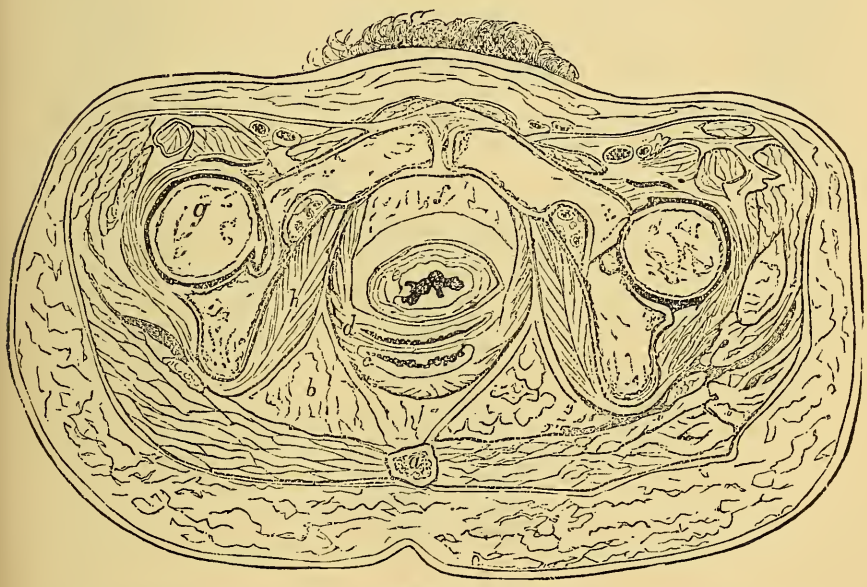


Fig. 46.

Transverse section of female pelvis at plane of hip-joints (Ruedinger). *a*, coccyx ; *b*, ischiorectal fossa ; *c*, rectum ; *d*, vagina ; *e*, bladder ; *f*, retropubic fat ; *g*, hip-joint.

termed the parametric tissue. By this term he meant the loose fatless tissue (2 cm. thick), with abundant blood-vessels and lymphatics, surrounding "the lower portion of the uterus and the upper portion of the vagina" (Spiegelberg). This is the parametric tissue proper. Some extend the meaning of the term parametric tissue so as to include all the connective tissue in the pelvis.

Coronal Section.—There has been published no frozen coronal section of the pelvis alone. Fig. 47 and Plate II. show Ruedinger's coronal sec-

tion of a female cadaver, but this displays little of the pelvic relations. This section will, however, be considered afterwards.

A useful diagram of a coronal section of the pelvis is given by Luschka. It shows well the relations of the cavity of the pelvis to the sub-peritoneal

Fig. 47.

Coronal frozen section of pelvis (Ruedinger). *a*, fundus uteri; *b*, bladder; *d*, labium minus; *e*, labium majus.

connective tissue and the ischiorectal fossa (Fig. 48). These Luschka terms—

(1.) Cavum pelvis peritoneale (Fig. 48, *a*).
(2.) " " subperitoneale (do., *b*).
(3.) " " subcutaneum (do., *c*).

According to him the ischiorectal fossa communicates with the sub peritoneal connective tissue by means of minute apertures.

b. Results obtained by Injections of Water, Air, or Plaster of Paris.

The best summary of these results is given by Bândl, to whom on this point we are indebted for much valuable information.

König in his researches employed the bodies of women who had died a short time after labour from non-puerperal diseases, and injected air or water. The following briefly are his results:—(1.) Water injected between the layers of the broad ligament high up in front of the ovary passed first into the tissue lying at the highest part of the side wall of the true pelvis. It then passed into the tissue of the iliac fossa lifting up the peritoneum, and followed the course of the psoas, passing only slightly into the hollow of the iliac bone. Lastly, it separated the peritoneum from

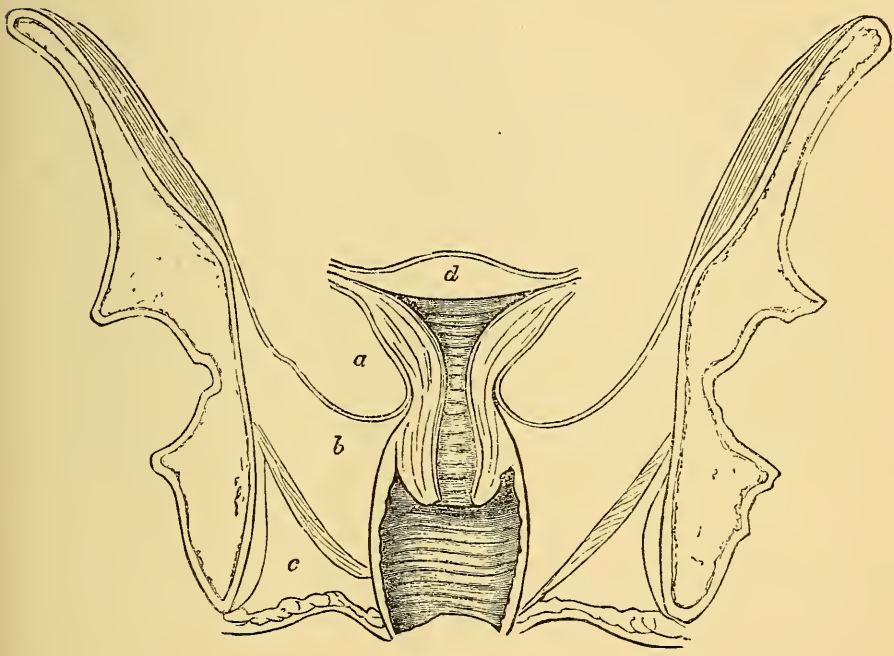


Fig. 48.

Diagram of coronal section of pelvis (Luschka). *a*, peritoneal cavity; *b*, subperitoneal cavity; *c*, ischio-rectal fossa; *d*, uterus.

the anterior abdominal wall for some little distance above Poupart's ligament, and from the true pelvis below it.

(2.) On injection beneath the base of the broad ligament to the side and in front of the isthmus, the deep lateral tissue became filled first; then the peritoneum became lifted up from the anterior part of the cervix uteri. The separation passed thence first to the tissue near the bladder, and ultimately the fluid passed along the round ligament to the inguinal ring. There it separated the peritoneum along the line of Poupart's ligament and passed into the iliac fossa.

(3.) An injection at the posterior part of the base of the broad ligament filled the corresponding tissue round Douglas' space, and then passed on as described at (1).

Schlesinger has followed out these results in more elaborate researches, which, we regret, space prevents us quoting.

The significance of these investigations will be referred to under Pelvic Peritonitis and Pelvic Cellulitis.

CHAPTER II.

THE POSITION OF THE UTERUS AND ITS ANNEXA, AND THE RELATION OF THE SUPERJACENT VISCERA.

LITERATURE.

Braune—Op. cit. *Claudius*—On the Position of the Uterus: Med. Times and Gazette, 1865, p. 5. *Credé*—Beiträge zur Bestimmung der normalen Lage der gesunden Gebärmutter: Archiv. f. Gynäkologie, Bd. I., S. 84. *Foster*—A Contribution to the Topographical Anatomy of the Uterus and its Surroundings: Am. J. of Obst., XIII., p. 30. *Hasse*—Beobachtungen über die Lage der Eingeweide im weiblichen Beckeneingange: Archiv. f. Gynäk., Band VIII., S. 402. *Pirogoff*—Op. cit. *Sappey*—Op. cit. *Schroeder*—Op. cit. *Schultze*—Zur Kenntniss von der Lage der Eingeweide im weiblichen Becken: Archiv. für Gynäk., Bd. IX., S. 262. An admirable account of the subject will be found in Dr. Van de Warker's articles on a study of the Normal Movements of the Unimpregnated Uterus: N. Y. Medical Journal, XXI., p. 337; and on the Normal Position and Movements of the Unimpregnated Uterus: Am. J. of Obst., Vol. XI., p. 314. The literature is also well given there and in Foster's paper.

The amount of literature, chiefly French and German, on this subject is much too extensive even to be mentioned here. This is partly due to the inherent difficulty of accurate clinical observations, to the erroneous opinions advanced by many eminent anatomists, and to arbitrary demands as to the normal uterine position made by gynecologists with strong opinions on anteversion.

Thus, in the well known works of Braune, Luschka, Cruveilhier, and Henle, the uterus is figured from actual sections as normal with the fundus in the hollow of the sacrum, *i.e.*, retroposed. Claudius of Marburg, also an anatomist, is uncompromising on this point. He states, indeed, that the uterus is normal only when, with its broad ligaments, its posterior surface touches the sacrum as closely as the lungs do the ribs (Fig. 49). Now, all gynecologists agree, from clinical observation, that the body of the uterus lies over on the bladder, with the os uteri looking more or less back. This divergence of opinion is extraordinary; and it

leads to this interesting practical observation, that what the anatomist considers a uterus normal in position, the gynecologist believes to be abnormal. That is, the retroverted uterus—considered normal in cadavera by the anatomist—is, when found in the living woman, replaced by the gynecologist so that it lies with its body over the bladder.

There can be no doubt that the uterus lies normally to the front, with its anterior surface resting on the bladder. Great refinement is exercised, quite unnecessarily, by many gynecologists in settling what they believe to be the exact angle which the long axis of the uterus should make with

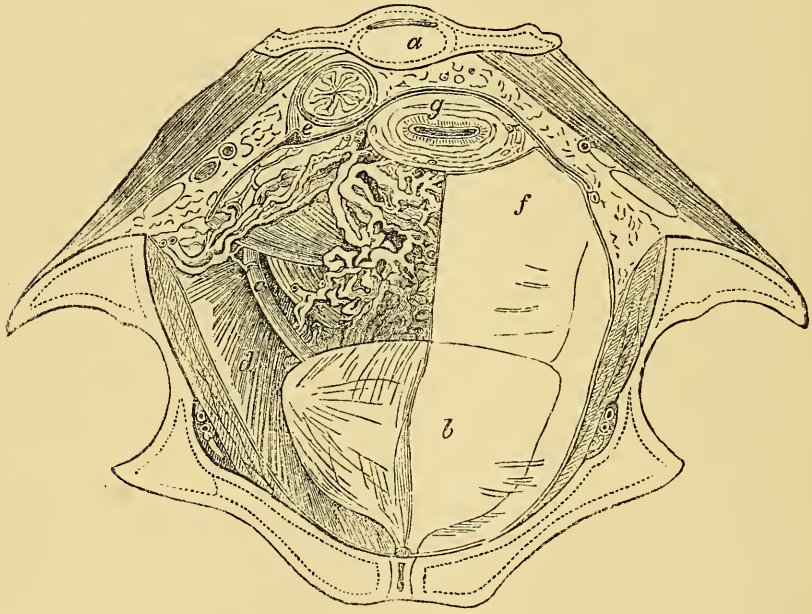


Fig. 49.

Transverse section of pelvis in line of pyriform muscles (Luschka). The peritoneum has been removed on the right side. *a*, 3d sacral vertebra; *b*, bladder; *c*, ureter; *d*, levator ani; *e*, rectum; *f*, anterior layer of broad ligament; *g*, uterus; *h*, pyriform muscle. Note that here the uterus is retroverted, and the pouch of Douglas without intestine.

the horizon, when a woman is in the erect posture; and this refinement has been greatly stimulated by the mechanical treatment of what is known by many as anteversion of the uterus.

In treating of this vexed question we shall consider—

1. The normal form and position of the uterus.

2. The local divisions of the pelvic floor peritoneum as viewed through the pelvic brim, and the position of the uterus and its annexa.

3. The physiological changes in the position of the uterus.

4. The relation of the small intestine to the pelvic floor and to the uterus and its annexa.

THE NORMAL FORM AND POSITION OF THE UTERUS.

The question of form of the uterus we consider only in the limited aspect of the angular relation of the long axis of the uterus to the long axis of the cervix. These are not in the same straight line but, when the bladder and rectum are empty, lie at an obtuse angle of varying value.

Fig. 50.

Diagram to show the normal form and position of virgin uterus (Schultze).

This angle is much less in multiparous women (Fig. 27), and more marked in nulliparæ (Fig. 50). The position of the uterus, with empty bladder and rectum, is such that it lies with its anterior surface touching the posterior aspect of the bladder, no intestine intervening: the os externum uteri looks downwards and backwards; and the uterus is slightly twisted as a whole on its long axis, so that the uterine end of the right Fallopian tube is nearer the symphysis than that of the left. We have expressly said with bladder and rectum empty. According to Schultze, the long axis of the uterus is nearly parallel to the horizon. This is

probably exaggerated, as Schultze's researches were conducted in a way that certainly anteverted the uterus unduly (Figs. 27 and 50). Many authors figure the uterus nearly vertical to the horizon, for this purpose distending the bladder until the uterus is elevated to what they consider the proper angle (Fig. 51). It is needless to say how absurd this is. Kohlrausch's diagram, so often quoted in support of this allegation, really

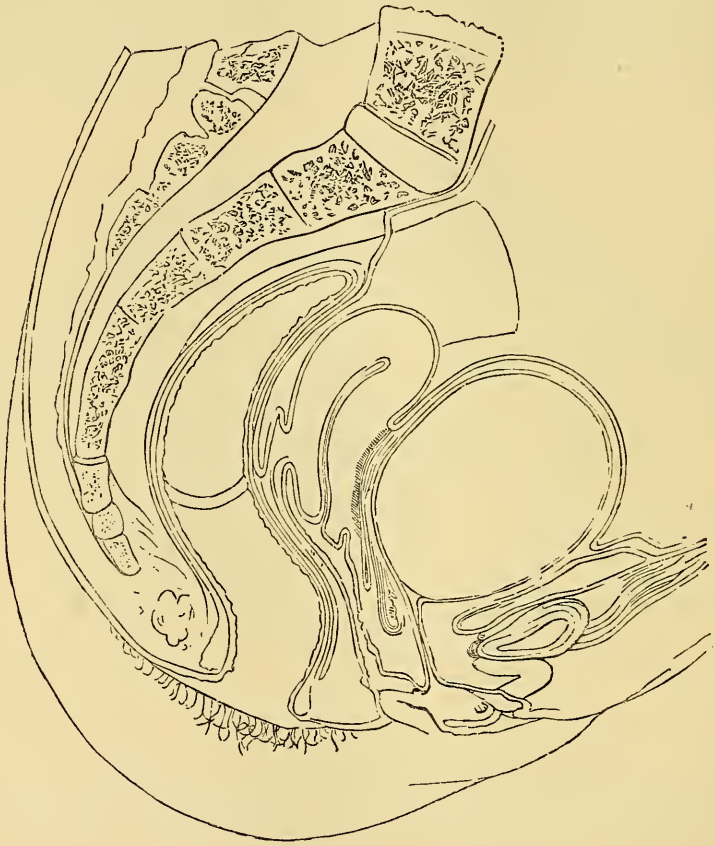


Fig. 51.

Section of pelvis, showing uterus driven back by distended bladder and peritoneum disturbed (Kohlrausch). *This is not a normal condition of parts by any means.*

shows, if it show anything, the position of the uterus when the bladder is well distended. The student should note this point, as Kohlrausch's section is the favorite diagram of those who treat as pathological what is really a normal uterus. Fig. 52, from Pirogoff, shows a frozen section supporting Schultze's contention.

It is important to know how results as to the uterine position have been obtained. The chief methods are as follows:

(1.) *By Frozen, Spirit-hardened, or Chromic Acid Sections.*—Results obtained in this way are not specially valuable, as there is some *post-mortem* change in the uterine position not yet thoroughly understood.

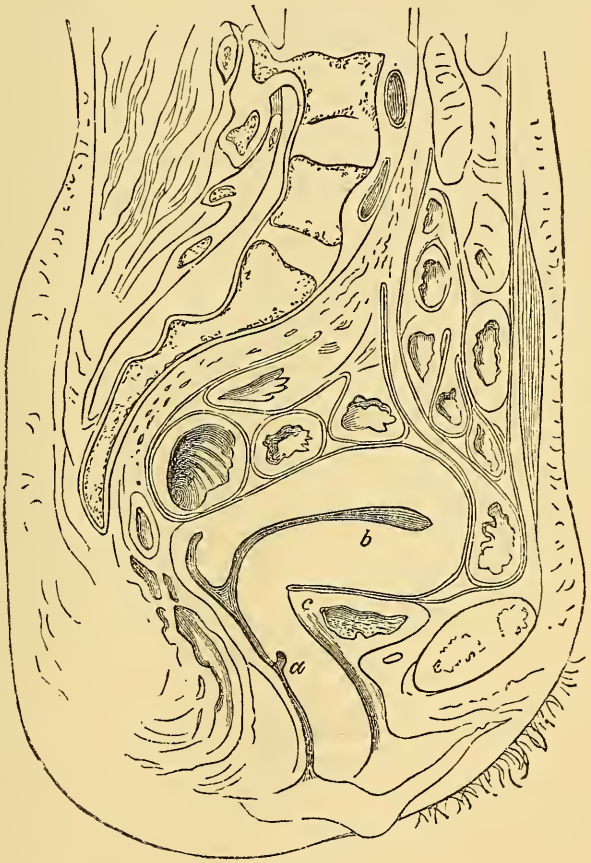


Fig. 52.

Section of female cadaver (Pirogoff). *a*, vagina; *b*, uterus; *c*, bladder. Note bladder in diastole, uterus parallel to horizon, and shallow dip of Douglas' pouch.

(2.) *By the Bi-manual Examination of the Pelvic Contents.*—This is probably the best method, although it exaggerates the normal anteversion of the uterus in a way that will be readily understood when the chapter on the bi-manual has been studied.

(3.) *By the use of the Sound,* or by a more elaborate means described by Schultze. Space does not permit of a full description of the latter, but a good account of it is given in Foster's paper.

THE LOCAL DIVISIONS OF THE PELVIC FLOOR PERITONEUM AS VIEWED THROUGH THE PELVIC BRIM, AND THE POSITION OF THE UTERINE ANNEXA.

For valuable papers and sections on this subject, we are indebted to Hasse of Breslau and Ruedinger of Munich (Fig. 53 and Plate II.). Hasse

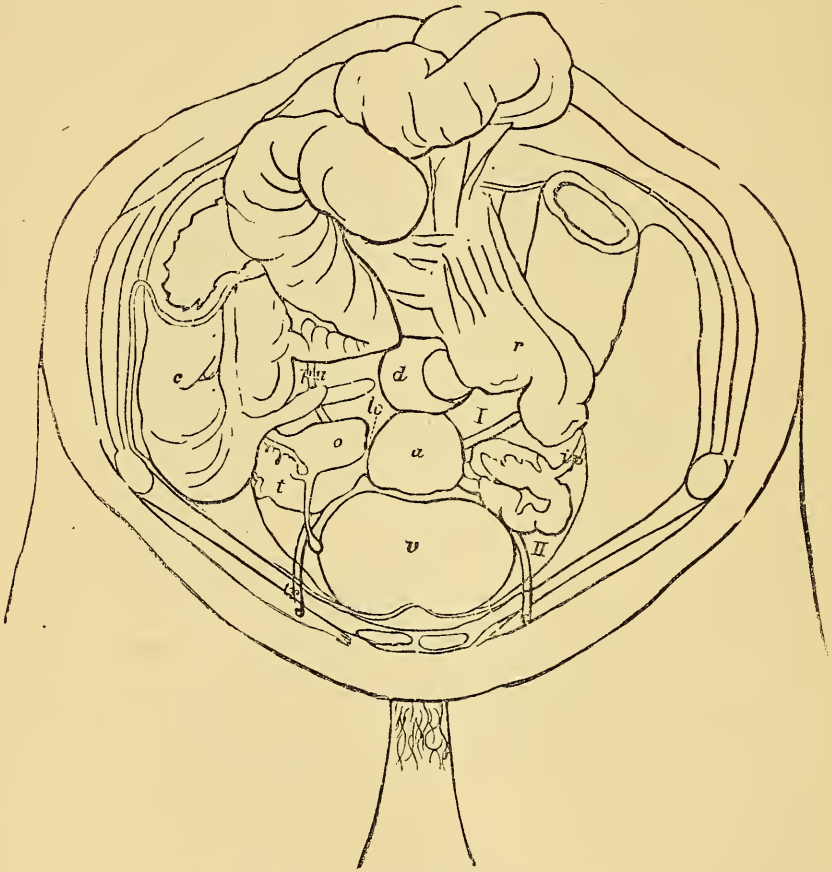


Fig. 53.

Female pelvis and contents viewed through the pelvic brim (Hasse). *v*, bladder; *II*, paravesical pouch; *u*, uterus; *o*, ovary; *t*, Fallopian tube; *d*, pouch of Douglas; *I*, lateral pouch of Douglas; *i p*, infundibulo pelvic ligament; *l r*, round ligament; *p u*, position of ureter; *l o*, ovarian ligament; *r*, rectum; *c*, colon.

froze not quite thoroughly a female cadaver in the upright posture, cut through the abdomen transversely, and then lifted out the softened viscera until the pelvic contents were exposed undisturbed. The bladder was moderately distended.

Fig. 53 shows Hasse's drawing. The fundus of the uterus lying on

the bladder is well seen. In front of the broad ligament—of which the infundibulo pelvic ligament is the only portion visible in Fig. 53—we have, on each side, the paravesical pouch of the peritoneum. Behind it lies the lateral pouch of Douglas; while just behind the uterus, and bounded on each side by the utero-sacral ligament, is the pouch of Douglas proper. The Fallopian tubes lie in the true pelvis, in the paravesical pouch. Each broad ligament sweeps outwards and backwards to near the sacro-iliac synchondrosis of its own side. The position of the ureter is well indicated.

According to Hasse the long axis of both ovaries runs outwards and forwards, forming, with the transverse axis of the uterus, an angle open to

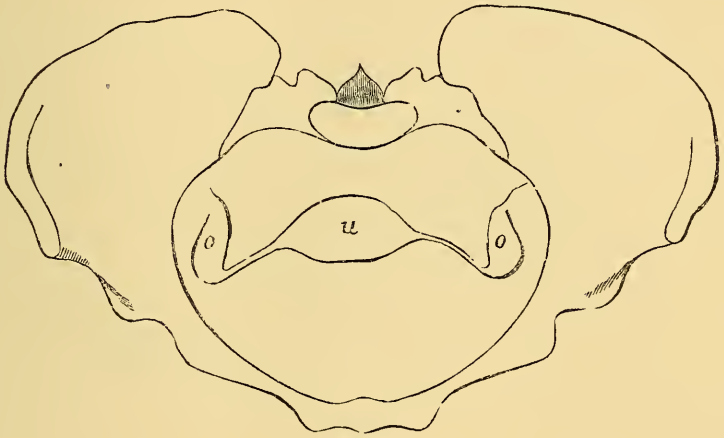


Fig. 54.

Position of fundus uteri and lie of ovaries. Bladder distended (Schultze).

the front. Part of each ovary (the half) projects above the plane of the pelvic brim. Schultze, on the other hand, figures the ovaries as having their long axes almost antero-posterior (Fig. 54).

THE PHYSIOLOGICAL CHANGES IN THE POSITION OF THE UTERUS.

The mobility of the uterus is one of its most characteristic features. With every movement of respiration, in singing, walking, and in all violent movements, the uterine position is changed. Dr. Van de Warker has studied, in a valuable paper, the influences bringing about these changes in position; this may be consulted for details of the method of investigation and results obtained.

Of the greatest importance is the effect of the distended bladder on the uterine position. As the bladder fills, the uterus becomes retroposed to an extent shown at Figs. 51 and 54. The intestines are forced out of the upper part of Douglas' pouch, and the height of the peritoneal reflection from the anterior abdominal wall is considerably increased. All

Fig. 55.

Position of uterus. *A*, when bladder and rectum empty; *B*, *C*, *D*, according to distention of bladder (Van de Warker).

these points are well illustrated by Fig. 44 from Pirogoff. As the urine is evacuated, the uterus passes forward to its normal anteverted condition and the intestines pass back into Douglas' pouch. Probably, undue distention of the bladder leads to permanent retroversion in some cases, especially if the uterus be gravid. Rectal distention displaces the uterus forwards and to the right side.

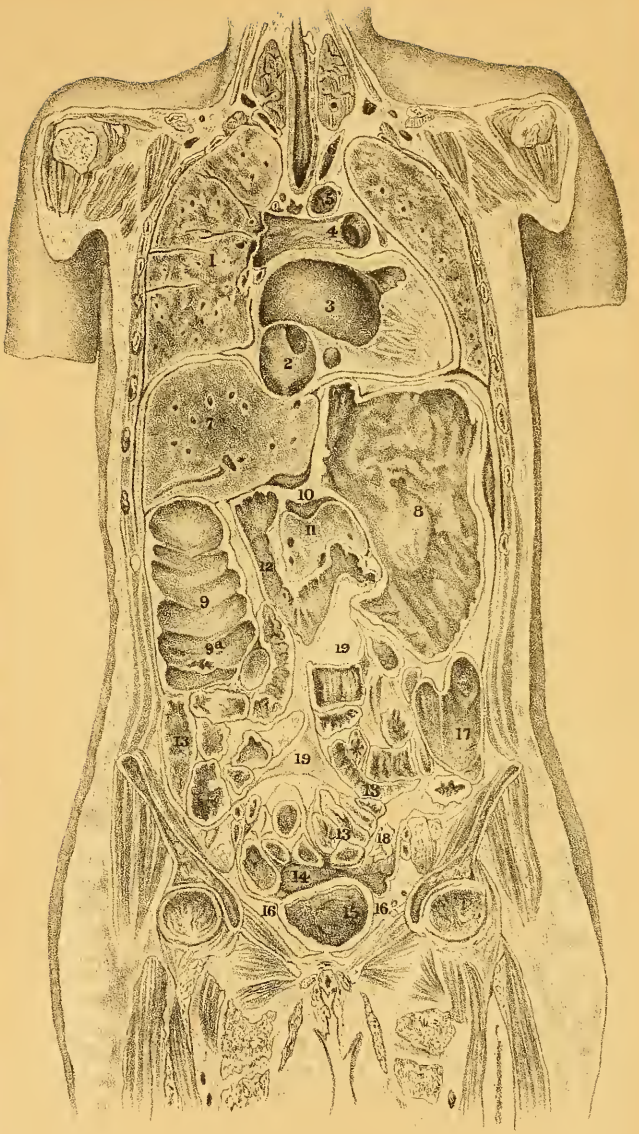


PLATE II.— CORONAL SECTION OF FROZEN FEMALE CADAVER
(RUEDINGER).

THE RELATION OF THE SMALL INTESTINE TO THE PELVIC FLOOR AND TO THE UTERUS WITH ITS ANNEXA.

The small intestine lies resting on the uterus, ovaries, Fallopian tubes, and broad ligaments. There is no small intestine in the vesico-uterine pouch. *When the bladder is empty and the unimpregnated uterus to the front, there is small intestine in Douglas' pouch except at its very lowest part.* The pouch of Douglas becomes emptied of intestine as the bladder distends, and has no intestine in it when the uterus is retroverted. Many authors assert that there is never small intestine in Douglas' pouch. This opinion is undoubtedly wrong, as any one can satisfy himself by studying sections. Often Douglas' pouch contains serum, and this displaces the intestine. Figures 35, 39, 44 bear out these opinions; Fig. 47 and Plate II. should be carefully studied as illustrating the position of the superjacent intestines. The paravesical pouch probably contains intestine when the uterus lies to the front, and certainly contains it when the uterus is retroposed. Occasionally the omentum may interpose between the small intestine and the pelvic viscera.

To sum up briefly:—

a. The uterus and bladder behave practically as one organ *qua* position (*i.e.*, they move together), when the uterus is to the front.

b. The exact angle which the uterus makes with the horizon cannot be fixed, and knowledge on this point is not necessary.

c. The uterus lies normally to the front, but has a range of mobility indicated in Fig. 55. The posterior lip of the cervix is 1.5 to 3 cm. above the tip of the coccyx. By digital pressure the uterus can be elevated about 4 cm. (1½ in.).

CHAPTER III.

THE STRUCTURAL ANATOMY OF THE FEMALE PELVIC FLOOR: THE PELVIC FLOOR PROJECTION.

LITERATURE.

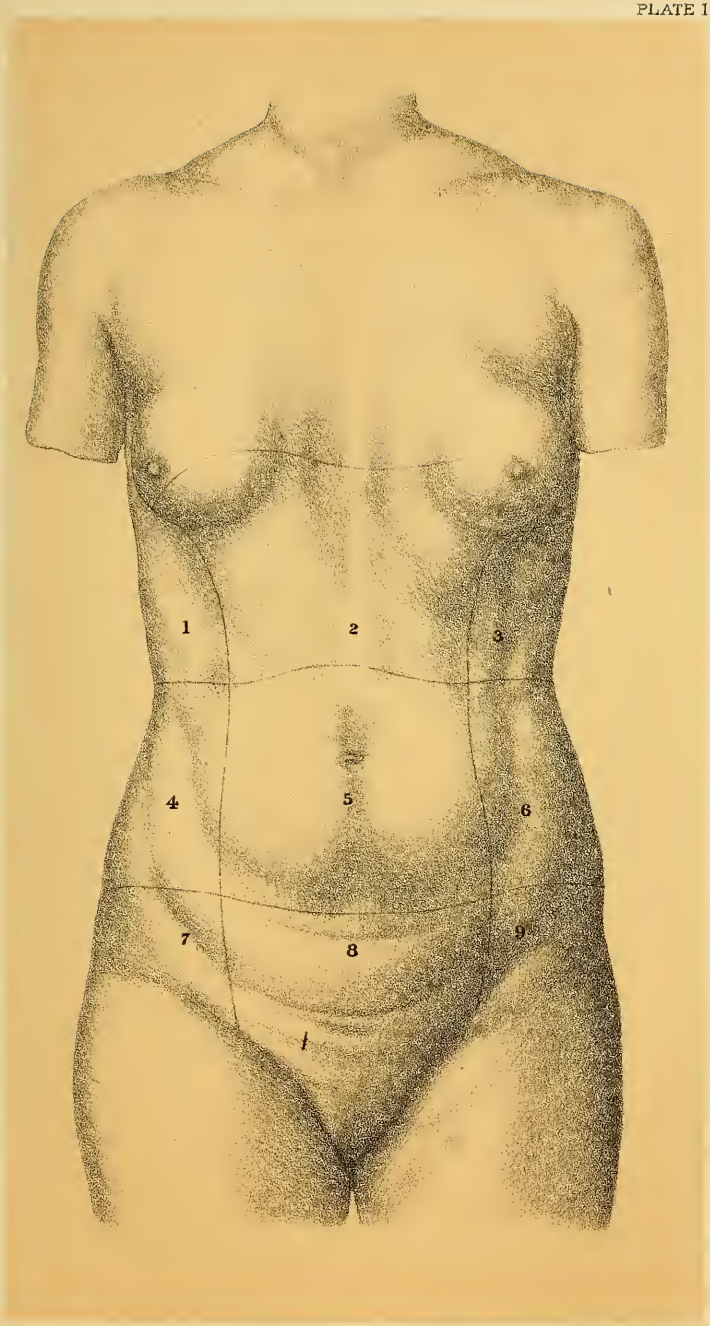
STRUCTURAL ANATOMY. *Hart*—The Structural Anatomy of the Female Pelvic Floor: Edinburgh, 1881.

PELVIC FLOOR PROJECTION. *Foster*—Op. cit. *Schroeder*—Op. cit. Noch ein Wort über die normale Lage und die Lageveränderungen der Gebärmutter: Arch. f. Gynäk., Bd. IX., S. 68. *Schul ze*—Op. cit. *Simpson and Hart*—The Relation of the Abdominal and Pelvic Organs in the Female: W. and A. K. Johnston, Edinburgh and London, 1881.

THE STRUCTURAL ANATOMY OF THE FEMALE PELVIC FLOOR.

HITHERTO we have regarded the pelvic floor in detail as made up of bladder, vaginal walls, rectum, connective tissue, and peritoneum. In this chapter we purpose considering it in its structural aspect. In its formation, the following functions have been provided for. As compared with the floor of the male pelvis, the female pelvic floor differs in having in it the cleft known as the vagina. Then, further, women have to undergo parturition in which the child is born through the vagina, which is then greatly distended. At the same time a woman has resting on her pelvic floor the same abdominal viscera as the male, and her pelvic floor is also subjected to the same strain from intra-abdominal pressure. Thus we have to explain how the female pelvic floor has been constructed so as to allow of parturition and yet remain strong enough to resist ordinary intra-abdominal pressure. The question is a *structural* or architectural one. We study it in this present chapter just as we would study the structure of a box or chair.

In order to understand this question, we must look at the pelvic floor in sagittal mesial section as at Fig. 40. In this view we see the pelvic floor or diaphragm stretching from symphysis pubis to sacrum. The anus is to be imagined closed as in life. The first thing to note is the vagina, which



SURFACE-VIEW OF ABDOMEN AND THORAX; THE SECTION IS SEEN AT PLATE II.

1. Right Hypochondriac.
2. Epigastric.
3. Left Hypochondriac.
4. Right Lumbar.
5. Umbilical.
6. Left Lumbar.
7. Right Iliac.
8. Hypogastric.
9. Left Iliac.

The uppermost line indicates the position of the Diaphragm.

is seen as a cleft running upwards in the pelvic floor from hymen to cervix uteri. Its walls are in close apposition (*vide* Figs. *passim*). They are often erroneously represented apart; in order, as it were, to let the student *see* the vagina. This is wrong, however. It is no more necessary to figure the vaginal walls always apart, than it would be always to sketch a man with his mouth open to render it visible. The first idea one gets on looking at such a section is that, owing to the apposition of the vaginal walls, the pelvic floor in the woman is unbroken; and that the vaginal cleft, the introduction of which does weaken the floor somewhat, cuts the floor not perpendicularly to the horizon but obliquely at an angle of about 60°.

The pelvic floor, as seen in this section, is made up of two segments which are known as the *pubic* and *sacral* segments. It is of importance to define these exactly.

The *Pubic Segment* is made up of loose tissue, viz., bladder, urethra, anterior vaginal wall, and bladder peritoneum. It is attached in front to the symphysis pubis. This attachment is a loose one; the bladder and urethra, meeting one another at right angles, are separated from the pubis by the pyramidal deposit of loose fat already described as the retropubic fat deposit. Note specially that the retropubic fat deposit as seen in this section—that of a woman in the dorsal or the erect posture—is triangular; and that the peritoneum passes from the anterior abdominal wall on to the fundus of the bladder, just a little above the top of the symphysis.

The *Sacral Segment* is attached to the coccyx and sacrum; it consists of rectum, perineum, and strong tendinous and muscular tissue. The inferior portion of this segment, the perineum, lies about 1½ inch from the symphysis.

So far we have described the mesial attachments of the segments. The pubic segment, however, is also attached on each side to the anterior bony pelvic wall, while the sacral segment is attached in a like manner to the posterior bony pelvic wall. Finally, these two segments blend with one another on the right and left sides of the vagina.

The two segments are thus *anatomically* contrasted:—

The pubic segment is made up of loose tissue and is loosely attached to the pubic symphysis; the sacral segment is made up of strong tissue and is firmly dovetailed into the sacrum and coccyx.

They are further contrasted *functionally*:—

The pubic segment is drawn up during labour; the sacral segment is driven down.

The proof for this functional contrast is too elaborate to be given here and will be found given in detail in Dr. Hart's atlas. It may be briefly explained, however, that during labour the pubic and sacral segments act like two folding doors. Uterine action pulls up the pubic segment, and drives the child down against the sacral one. This action is analogous to

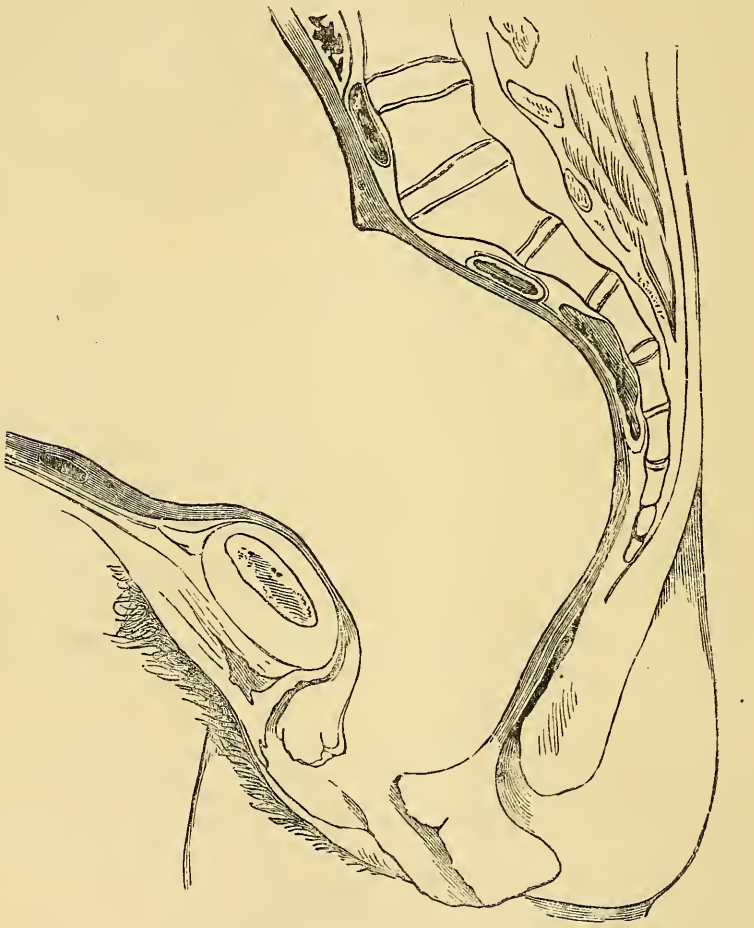


Fig. 56.

Pelvic floor differentiated in parturition (Braune). The pubic segment is drawn up and the sacral one driven down. Note position of bladder and its peritoneum: for lettered description, see Fig. 43.

the way one passes out through two folding doors, where he pulls the one door towards him and pushes the other from him.

As the result of this elevation of the pubic segment, the bladder is drawn above the pubis and its peritoneum stripped off (Fig. 56).

In addition to the retropubic fat deposit, it should be noted that—

a. The posterior wall of the bladder is *loosely* attached to the anterior vaginal wall;

b. The urethra and anterior vaginal wall are *closely* blended;

c. The posterior vaginal wall and anterior rectal wall are *loosely* connected, as far down as the apex of the perineal body (Fig. 35).

There are three lines of cleavage in the pelvic floor (Fig. 57).

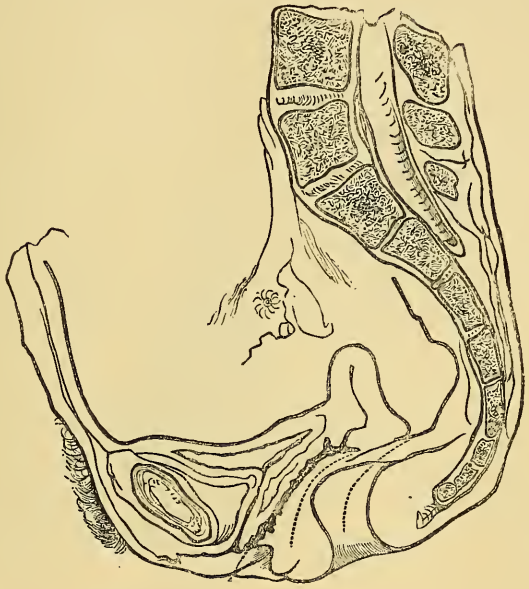


Fig. 57.

Lines of cleavage indicated by dotted lines. From before backwards they are—1, physiological; 2, pathological; 3, bi-manual (Hart).

1. Physiological, between the vaginal walls; all in front of this line is drawn upwards in parturition.
2. Pathological, between the posterior vaginal and anterior rectal walls; all in front of this is displaced downwards in Prolapsus uteri.
3. Bi-manual, between the anterior and posterior rectal walls; all in front of this is displaced on bi-manual recto-vaginal examination.

From the structural arrangement of the pelvic floor, it results, as will be shown more fully afterwards, that—

1. There is a definite opening up of the pelvic floor during parturi-

tion and when a woman assumes the genupectoral posture with the vaginal orifice opened up;

2. There are produced definite displacements of the pelvic floor when the various specular means of exploring it are employed and under excessive intra-abdominal pressure or hypertrophic growths of the cervix.

The nomenclature employed should be noted. It is better to speak of the pubic segment being separated from the sacral one than of the vaginal walls being apart. The vaginal walls are not special structures. The anterior vaginal wall is the posterior boundary of the pubic segment; the posterior vaginal wall is the anterior boundary of the sacral segment. Thus they are analogous to the *edges* of two folding doors. We shall refer to this again under prolapsus uteri and examination with the Sims speculum.

The question of the support of the uterus is still disputed. The broad and round ligaments have nothing to do with its support; they are only useful as giving fixed points for the contracting uterine muscle during parturition. The utero-sacral ligaments, however, probably help in supporting the uterus.

Many allege most erroneously that the vagina supports the uterus, as if the vagina were a special structure. *The chief support is the compact unbroken pelvic floor*, on which the uterus rests just as one sits on a chair. It is the whole pelvic floor that supports the uterus and viscera, not the perineum alone. The perineum is only a small though strong part of the sacral segment.

The various components of the pubic segment are definitely displaced in its movements. Thus the retropubic fat is—

1. Behind the pubis in the non-parturient female (Fig. 52);
2. Above it in the parturient female (Fig. 56);
3. Below it in prolapsus uteri;
4. Below it in the extra pelvic floor projection of pregnancy;
5. Partially above the symphysis in the genupectoral posture (Fig. 65).

The peritoneum is—

1. Reflected on to the top of the empty bladder in the non parturient female;
2. Stripped off the bladder during parturition;
3. Reflected on to fundus of empty bladder, at a higher level above symphysis, in the genu-pectoral posture.

Thus the peritoneum over the bladder is movable; the peritoneum over the sacral segment is fixed.

It will now be seen that the structural problem stated at the beginning of the chapter is solved thus. The sacral segment, strengthened at its tip by the perineum, is the supporting one; it holds the pubic segment, just as the hand at Fig. 58 holds the pessary. The anterior margin of the sacral segment stops short at the pubis by about 1½ inch, and this interspace is filled up by the pubic segment. Intra-abdominal pressure presses the pubic segment against the oblique sacral one which closes the pelvic outlet, therefore, like a valve; excessive intra-abdominal pressure displaces, in prolapsus uteri, a definite part of the pelvic floor in front of the anterior rectal wall.

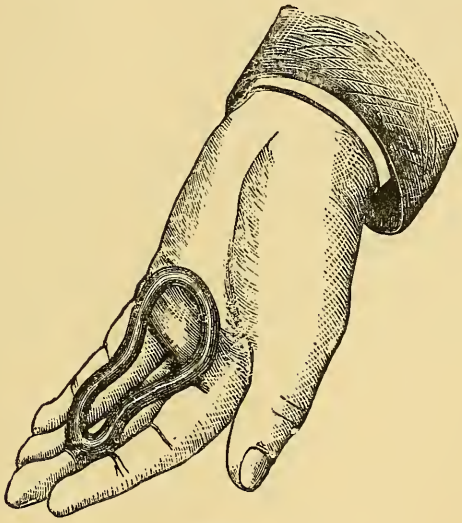


Fig. 58.

Hand holding pessary.

PELVIC FLOOR PROJECTION.

By this is understood the amount of projection of the pelvic floor, in sagittal mesial section, *beyond the straight line joining the tip of the coccyx and the subpubic ligament—conjugate of outlet* (Fig. 59).

Definite results have not as yet been obtained, but this is one special reason why attention should be directed to it.

Schroeder measured the conjugate at the outlet with callipers; and

then passed a measuring line from the coccyx to the apex of the pubic arch, the tape following the curve of the pelvic floor. The subjoined table gives some of his results.

	Distance from tip of coccyx to lower border of symphysis.	
	By tape measure.	By callipers.
	c.m.	c.m.
Average of the pregnant women.....	13.35	9.15
" " gynecological patients.....	12.6	8.27
" " nulliparæ.....	13.2	8.75

Schroeder's deduction is that the average projection of the pelvic floor beyond the plane of the pelvic outlet is 4.1 c.m. There is no doubt that this is an excessive average, as may be seen by consulting the pelvic section in Schroeder's manual.

F. P. Foster of New York has written ably on this subject and made a

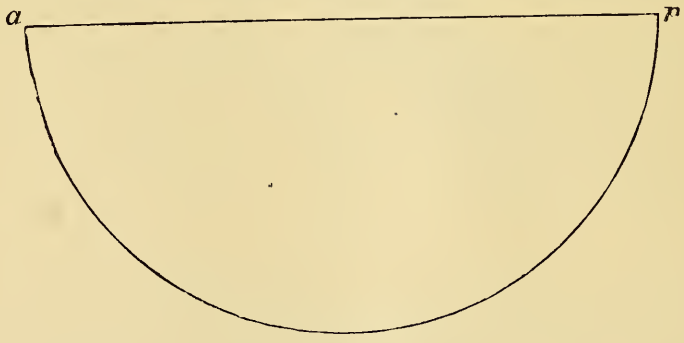


Fig. 59.

Diagram to show what is meant by pelvic floor projection. a, p = conjugate of outlet. A perpendicular bisecting a, p, and cutting the arc gives the greatest pelvic floor projection (F. P. Foster).

large series of observations. Fig. 60 shows the callipers he employed. An end of each limb (*a* and *b*) is placed on the tip of the coccyx and lower border of the symphysis pubis. The horizontal bar between these limbs is graduated in c.m., and the limb (*a*) glides along it in a groove. A movable upright (*c*), also graduated, has its upper point placed against the most projecting part of the pelvic floor. If now the whole apparatus be removed and laid flat on a sheet of paper, the conjugate and amount of projection can be read off at once. Greater accuracy is ensured by noting,

before removing the apparatus, the point on the transverse bar at which the upright (*c*) stands as well as the reading which it gives.

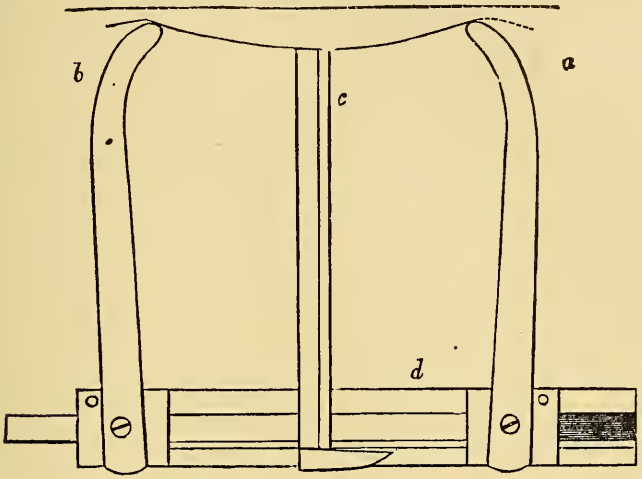


Fig. 60.
Callipers for measuring pelvic floor projection (Foster).

Foster's average (2.5 c.m.) of the pelvic floor projection is less than

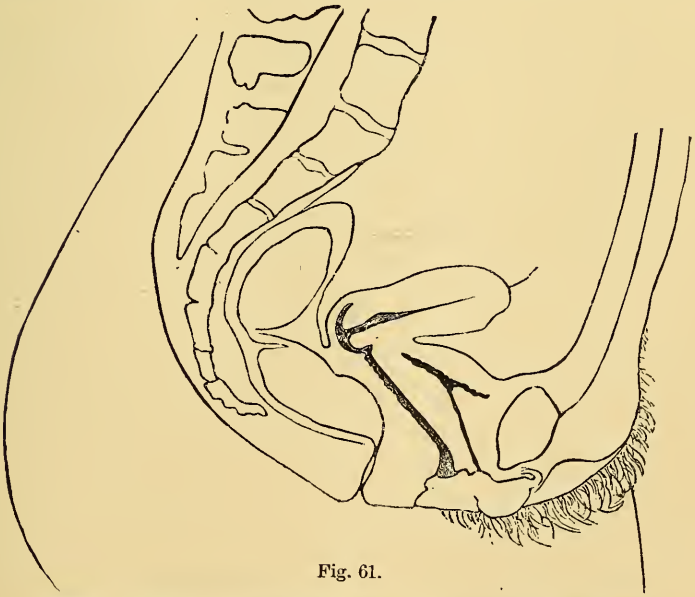


Fig. 61.
Diagram of pelvic floor projection and position of uterus, modified from Foster.

Schroeder's. He placed his patient semiprone, however; a position in which the pelvic floor projection is slightly diminished. Fig. 61 shows

Foster's diagram of pelvic floor projection. The uterus has been more anteverted than in Foster's original drawing.

Measurements made on frozen sections cannot be trusted. Schroeder has justified his average by such measurements, but has taken no account of the existence of pregnancy in some of the cases.

We might tentatively advance the following statements :—

(1.) The pelvic floor projection is over-estimated by Schroeder;

(2.) Foster's and Schultze's average is nearer the mark ;

(3.) The retropubic fat gives a rough index of the position of the pubic segment (Figs. 41, 42, 50) ;

(4.) The pelvic floor projection is increased by advanced and even by early pregnancy (Braune's Plates).

The whole enquiry needs further investigation in order to settle also other points, among which we may mention the relation of the vagina to the pelvic outlet and the varying amount of pelvic floor projection in different postures.

DISTRIBUTION OF OVARIAN, UTERINE, AND VAGINAL ARTERIES (HYRTL).

H. BENCKE, LITH. N.Y.

PLATE III

CHAPTER IV.

THE BLOOD-VESSELS, LYMPHATICS, AND NERVES OF THE PELVIS: DEVELOPMENT OF PELVIC ORGANS.

LITERATURE.

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BLOOD-VESSELS.

We consider (1.) the arterial supply of the uterus, ovary, Fallopian tube, vagina, bladder, and rectum; (2.) that of the perineal region; (3.) the venous distribution.

(1.) *Arterial Supply to Uterus, Ovary, etc.*—The *ovarian artery* of each side (corresponding to the spermatic of the male) is a branch of the abdominal aorta. Its relations when in the abdomen do not concern us here. In the pelvis it passes between the layers of the broad ligament, running tortuously towards the upper angle of the uterus. Near this it

divides into two branches. The upper supplies the fundus uteri; the lower anastomoses at the side of the uterus with the uterine artery (Plate III., *c*, *d*).

The Ovarian Artery gives off—

Branches to the ampulla of the Fallopian tube (Plate III., *a'* *a'*).

Branches to the isthmus (*b'*),

Numerous branches to the ovary (*c'* *c'* *c'*),

Branch to the round ligament (*b*).

The *Uterine Artery* (Plate III., *e*) springs from the anterior division of the internal iliac and passes downwards and inwards towards the cervix uteri. It then passes upwards between the layers of the broad ligament by the side of the uterus, in an exceedingly tortuous manner well shown in Plate III., to anastomose with the lower branch of the ovarian. Branches pass from it into the substance of the uterus; these are the curling arteries of the uterus. The *Vaginal arteries* (*g*, *g*, *g*) usually spring immediately from the anterior division of the internal iliac artery, but sometimes arise from the uterine or middle hæmorrhoidal. A special branch of the uterine artery to the cervix joins with its fellow at the isthmus to form the circular artery, and with those of the vagina to form the azygos artery of the vagina (*h*, *h*). The vaginal arteries anastomose freely with those of the opposite side. Plate III., from Hyrtl, illustrates beautifully the free anastomosis of branches of the aorta with the ovarian, uterine, and vaginal arteries. It should be noted that, in an operation for removal of uterus, ligature of the broad ligament controls all hemorrhage.

From the same anterior division of the internal iliac, proceeds the blood supply to the bladder and rectum.

(2.) *Arterial Supply* to the perineal region.—This comes from the internal pudic. The superficial perineal branch supplies the labia; the artery to the bulb supplies the bulbus vaginæ; the terminal branches go to the clitoris.

(3.) *Venous Supply.*—The venous supply of the pelvis is very abundant, and exists in the form of numerous plexuses freely communicating with one another. The veins are unprovided with valves. Hemorrhage from a wound is therefore often exceedingly profuse, especially during pregnancy when the whole pelvic vascular system is hypertrophied.

The following is a summary of the main facts as to the venous supply of the female pelvis.

The *vesical plexus* lies external to the muscular coat of the bladder.

The *hæmorrhoidal plexus* lies below the mucous membrane of the lower part of the rectum.

The veins of the labia correspond in distribution to the arteries, and those from the outermost parts drain into the pudic which opens into the

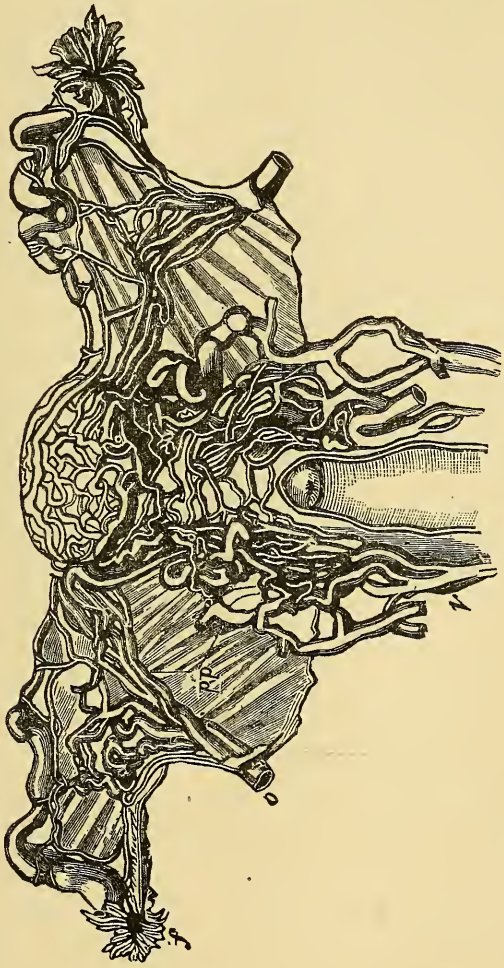

Fig. 62.

Uterus and vagina with their venous supply, seen from behind—(Luschka). *f*, Fallopian tube: *pp*, pampiniform plexus.

common iliac vein. Large veins from the labia minora open into the pars intermedia of the bulb.

The veins from the glans and corpora clitoridis pass into the dorsal vein of the clitoris, which communicates with the vesical plexus.

The veins of the bulb pass into the vaginal plexus.

The *vaginal plexuses*—one outside the muscular coat and one in the

submucous tissue—are most abundant at the lower part of the vagina, communicate with the hæmorrhoidal and vesical plexuses, and open into the internal iliac vein.

The *uterine plexus* is very abundant, as is well shown in one of Hyrtl's plates; it ultimately opens into the ovarian veins (Fig. 62), which pass, on the right side to the inferior vena cava, on the left to the left renal vein. The veins are small, lie in the outer muscular coat, and run longitudinally; they open into large sinuses in the middle layer of the coat, with which the capillary vessels communicate.

The *ovarian* plexus, otherwise known as the pampiniform plexus, lies between the folds of the broad ligament and communicates with the uterine plexus (Fig. 62). Some apply this term to all the veins in the broad ligament. The ovarian plexus opens into the inferior vena cava.

Beneath the peritoneum and between the layers of the broad ligaments are vast venous plexuses. Knowledge on this point is of the highest importance in relation to pelvic hæmatocele.

The vesical, hæmorrhoidal and vaginal plexuses, with the pudic veins, open into the internal iliac vein which opens into the inferior vena cava.

From the hæmorrhoidal plexus, the superior hæmorrhoidal vein passes into the portal system; and thus we get a communication between the pelvic and portal venous systems.

LYMPHATICS.

Under this we take up—

a. The Lymphatic Glands;

b. The Lymphatic Vessels.

a. The Lymphatic Glands.—These are (1.) the *inguinal glands*, which lie parallel to and just below Poupart's ligament; and (2.) the *pelvic glands*. These latter consist of (*a*) a gland at the isthmus uteri (Champonnière); (*b*) hypogastric glands, which lie subperitoneally in the space between the external and internal iliac vessels; (*c*) sacral, on the lateral aspect of the anterior surface of the sacrum and in the mesorectum; and (*d*) a gland or collection of small glands at the obturator foramen—the obturator gland of Guérin. These all pour into the lumbar glands, which lie in front of the lumbar vertebræ and discharge into the thoracic duct.

b. The Lymphatic Vessels. (1.) *Of External Genitals.*—Numerous vessels form a network on the internal aspect of the labia majora, over the labia minora and round the vaginal and urethral orifices, vestibule and

clitoris; all of these open into the inguinal glands. From this arrangement, the enlargement of the inguinal glands in syphilis and vulvar cancer is intelligible. The lymphatics of the *lower fourth of the vagina* also open into these glands.

(2.) *Of Vagina* (*upper three-fourths*) *and Cervix Uteri.*—The lymphatics from these open into the hypogastric glands. So far we have followed Sappey's description.

Le Bec asserts that the lymphatics of the vagina pour into a series of trunks at the level of the isthmus uteri, and that those of the cervix join them; and that the conjoined lymphatics then pass below the base of the broad ligament to the obturator ganglion, from which vessels communicate with others from the thigh and even from the epigastrium.

The relation between lymphatics and glands is as follows:—

(*a*) Those of the external genitals pass into the inguinal glands.

(*b*) The lymphatics of the vagina and cervix pass to the hypogastric glands (Sappey). According to Le Bec, they pass to the obturator gland.

(3.) *Of Uterus.*—The lymphatics of the body of the uterus pass through the broad ligaments, and, along with those from the ovary and Fallopian tube, enter the lumbar glands. If Le Bec be right, the lymphatics from the cervix pass *below* the broad ligament, and those from the uterus along the *upper* part of the same.

Leopold, who has investigated the lymphatics in the unimpregnated uterus, considers "the mucous membrane of the uterus as a lymphatic surface which contains no special lymphatic vessels, but consists of lymph sinuses covered with endothelium." "The lymph passes from the lymphatic spaces of the mucous membrane, through the mucous membrane hollows, into the lymph spaces and vessels of the muscular coat, surrounds here all the bundles up to the serous covering, and flows into the larger vessels which enter the broad ligament in the neighborhood of the vessels." (Loc. cit., S. 31.)

These are matters not of mere anatomical detail, but of the very highest pathological and practical importance. The richness of lymphatic supply to the vagina, cervix, and uterus explains the extraordinary rapidity with which septic matter spreads through the body, and the extreme danger which may attend even an insignificant lesion of the internal genital organs, when septic matter is present and is absorbed. We may remark here that septic matter will of course follow the lymphatic routes already laid down. It should not be forgotten, however, that the bacteria

passing along the lymphatic vessels may penetrate them, pass into the peritoneal cavity, and thence spread through the diaphragm to set up the pleurisy and pericarditis so common in septicæmia (Lusk). Thorough comprehension of lymphatic distribution and knowledge of the evil effects of septic matter are of the first importance to the student.

The lymphatics of *the Rectum* lie in two layers (mucous and muscular), and open into the glands of the mesorectum or into the sacral glands.

The stomata of the peritoneum of the pelvis communicate with lymph capillaries lying in the subendothelial tissue.

NERVES.

These are (*a*) Spinal, (*b*) Sympathetic.

(*a*) *Spinal.*—The following is the nervous supply of the pelvic muscles :—

Levator and Sphincter Ani are supplied by inferior hæmorrhoidal branch of pudic, 4th and 5th sacral, and coccygeal nerves ;

Coccygeus, by 4th and 5th sacral and coccygeal nerves ;

Muscles of Perineum and Clitoris, by the branches of pudic nerve.

(*b*) *Sympathetic.*—The hypogastric plexus, which lies between the common iliac arteries, gives off branches which, reinforced by branches from the lumbar and sacral ganglia and sacral nerves, form the *inferior hypogastric plexuses*—one on each side of the vagina. From these, filaments proceed to the vagina, uterus, Fallopian tube, and ovary.

The terminations of the nerves in the muscular layers of the uterus have been studied by Frankenhaüser, who figures them passing to the nuclei of the unstriped muscle. Those entering the mucous membrane are said to end in ganglia. Numerous end bulbs have been found in the clitoris and vagina.

DEVELOPMENT OF PELVIC ORGANS.

The following is a very brief summary :—

The *Wolffian bodies* appear in the fœtus about the third and fourth week. They fulfil the function of kidneys until the second month, and then wither.

The *Fallopian tubes, uterus* and *vagina* are derived from the Ducts of Müller. These appear on the anterior aspect of the Wolffian bodies.

Their lower portions coalesce to form the uterus and vagina; while, above, they remain separate, as the Fallopian tubes.

The *ovary* first appears as a thickening on the Wolffian bodies. It is made up of interstitial tissue projecting from them and covered by epithelium—the germ epithelium. According to Foulis, the ova are developed from the latter; the cells of the membrana granulosa are formed from the connective corpuscles of the interstitial tissue. Waldeyer believes that the ova and the cells of the membrana granulosa both originate from the germ epithelium; and in this Balfour agrees with him (*vide* chap. on Ovarian Tumours).

The *parovarium* arises as a small distinct structure at the summit of each Wolffian body. It persists in the female (Fig. 22). In the male it forms the epididymis.

The *clitoris* develops from a small eminence at the front of the urogenital sinus.

Up to the second month of fœtal life the genital urinary and intestinal ducts open into the cloaca, which then becomes divided by a transverse partition into a posterior anal, and anterior urogenital sinus. The *vestibule* in the adult female is simply the lower part of the latter sinus.

The *labia minora* results from the non-coalescence of folds analogous to those which, by their coalescence, form in the male the corpus spongiosum urethræ.

The *labia majora* are two folds which remain separate in the female but coalesce in the male to form the scrotum.

The *two bulbi vaginæ* are homologous to the corpus spongiosum urethræ.

For fuller details see Turner and Quain.

CHAPTER V.

PHYSICS OF THE ABDOMEN AND PELVIS, WITH SPECIAL REFERENCE TO THE SEMIPRONE AND GENU-PECTORAL POSTURES.

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In this chapter it is proposed to give a brief sketch of a subject of the highest importance but still in its infancy. The *résumé* must be restricted, from want of space, to certain practical points; we therefore consider here—

1. *The effect of intra-abdominal pressure on the female pelvic floor;*
2. *The results brought about by change of posture, especially by the genu-pectoral posture;*
3. *The effect on uterine position of digital pressure in the vaginal fornices.*

THE EFFECT OF INTRA-ABDOMINAL PRESSURE ON THE FEMALE PELVIC FLOOR.

We suppose the woman to be in the upright posture. For simplicity the pelvic floor is considered as being under fluid pressure. Fig. 63 shows the effect of this on the pelvic floor segments. The fluid pressure acts at right angles to the limiting surface which, in this case, is the pelvic peritoneum. Thus, if the perpendiculars be counted, starting from the symphysis, it can readily be seen that the first three will press the pubic seg-

ment against the symphysis; that the fourth and fifth will do this also, but will further have a resultant tending to drive the pubic past the sacral segment; that the sixth and seventh will, directly, tend to do this; and that the others will drive it partly past the sacral segment, and partly against it. From want of rigidity in the pubic segment, this driving down tendency is partly lost. Thus the effect of ordinary intra-abdominal pressure is to press the pubic against the sacral segment. Extra intra-abdominal pressure displaces downwards a definite portion of the pelvic floor—viz., all lying in front of the anterior rectal wall. There is in the

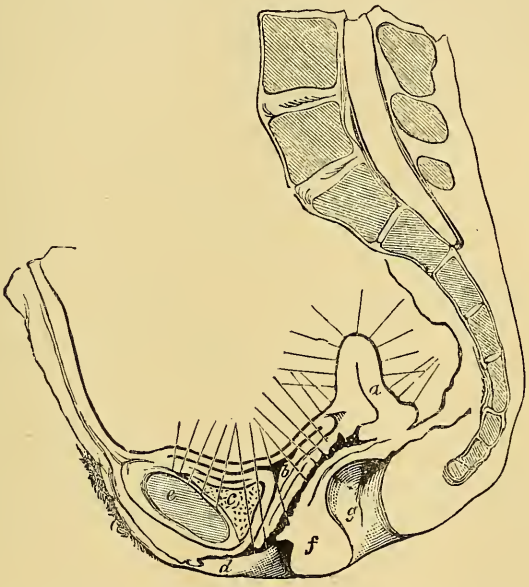

Fig. 63.

Diagram to illustrate effect of intra-abdominal pressure on the segments of the pelvic floor (*Hart*). *a*, uterus, pathologically ante-flexed; *b*, bladder; *c*, retropubic fat; *d*, labium majus; *e*, symphysis; *f*, perineal body; *g*, rectum.

pelvic floor a definite line of cleavage at which it yields, which line runs between the anterior rectal and posterior vaginal walls (see p. 63).

This definite downward displacement causes the lesion known as prolapsus uteri.

From this we see that the female pelvic floor is not equally strong throughout. It would be, were the sacral segment prolonged and attached to the symphysis pubis. But then parturition would have been an impossibility. It has been constructed not only *quâ* intra-abdominal pressure, but also *quâ* parturition.

THE RESULTS BROUGHT ABOUT BY CHANGE OF POSTURE, ESPECIALLY BY THE GENU-PECTORAL POSTURE.

The abdominal walls, along with the viscera bounded by them, are often spoken of as the abdominal cavity with its contained viscera. We must, however, keep in mind that this cavity is always perfectly full. There is never any vacuum in it. The viscera are always in apposition, with only a little fluid as a film separating them. The abdominal walls are yielding, and any tendency to a vacuum is counteracted by atmospheric pressure on the walls. The vertical height of the abdomen is too small to admit of a Torricellian vacuum; and therefore it is no more wonderful that we have no vacuum in the abdominal cavity, than that there is no vacuum in an ordinary test-tube filled with water and with its

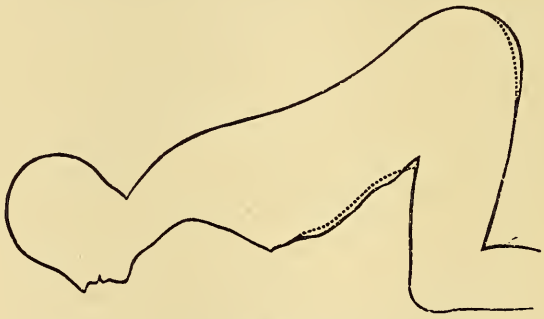

Fig. 64.

Outline of female figure in genu-pectoral posture. The dotted line indicates the contour when the vaginal orifice is unopened; the continuous line, the change in contour after air is admitted into the vagina (Simpson and Hart).

open end immersed. There would be a vacuum if the test-tube were above 33 feet long; and so would there be in a race of giants, the vertical height of whose abdominal cavity was such that the column of contained viscera could not be counterpoised by the atmospheric pressure. In no posture a woman can assume is there ever a vacuum in the abdominal cavity. However high the pelvis be, though the woman stand on her head, the small intestines still touch the uterus as they do in Fig. 47 and Plate II. The abdominal walls and viscera enclosed by them behave, therefore, like a plastic viscous fluid—like so much thick gum or treacle.

When a woman is in the *upright posture*, the viscera bulge above the symphysis pubis, more or less, according to her development. Plate I., shows this bulging in a well-formed nude female; the bulging is excessive if the woman is fat. Just below the sternum, the antero-

posterior diameter of the abdomen is lessened. The pelvic floor is convex as seen from without, *i. e.*, the pelvic floor projection is well marked. Atmospheric pressure is acting equally all over the abdominal and pelvic surfaces; but the pelvic floor, bearing the weight of the viscera, bulges more than the other boundaries of the abdomen. A fluid contained in a bag suspended from a fixed point is pyriform, with the bulb nearer the earth. This shape is due to the weight of the fluid.

If a woman be made to assume the *posture* known as the *genu-pectoral* (better *genu-facial*), the bulge of the viscera is at the sternum. The following points should be noted in regard to this posture (Fig. 64).

1. The antero-posterior diameter of the abdominal cavity is increased at the sternum.
2. It is diminished above the pubis and in the iliac fossæ.
3. The pelvic floor projection is diminished.
4. The pubic and sacral segments are still in contact, and the abdominal viscera always in contact with the uterus and one another.

Let us now contrast these postures.

Upright posture (Plate I.).	*Genu-pectoral posture* (Fig. 64).
1. Greatest antero-posterior (*a–p*) diameter of abdomen just above pubis.	1. Greatest antero-posterior diameter at sternum.
2. Least *a–p* diameter at sternum.	2. Least *a–p* diameter below pubis.
3. Pelvic floor projection at its maximum.	3. Pelvic floor projection diminished.
4. Pelvic floor segments in contact.	4. Pelvic floor segments in contact.

In the latter posture, on inspection of the genitals the labia can be seen to be furrowed and the skin over the ischiorectal fossa slightly hollowed. If now the labia majora and minora be separated and the fourchette lifted up, no further change as yet takes place: but when the hymen is opened up, air passes into the vagina (often with a distinct hiss) and the vaginal walls become separated, enclosing a somewhat large cavity. The bulge at the sternum is now slightly increased, while that above the pubis is diminished (see Fig. 64). *It is only when the anatomical entrance of the vagina (the hymeneal orifice) is opened up, that the vagina distends with air.*

It has been shown by Drs. Russell Simpson and D. Berry Hart, that the segments of the pelvic floor separate from each other when a woman

assumes the genu-pectoral posture and the hymeneal orifice is opened. The pubic segment passes down with the viscera; the sacral segment remains behind, recoiling slightly upwards. *Thus functionally, the pubic segment is visceral, the sacral one is vertebral.*

They have shown further that there is quite a definite displacement of the pubic segment constituents, viz. :—

a. The empty bladder is partly above the pubis;

b. The peritoneum passes from abdominal wall to symphysis, at a point 1½ inch above the latter;

c. The retropubic fat is partly above and partly below the top of the symphysis. We may now once more contrast these postures.

Upright posture (Plate I.).	*Genu pectoral posture* (with vagina distended by air) (Fig. 65).
1. Pubic and sacral segments in apposition and vagina a slit.	1. Pubic and sacral segments separated and vaginal walls bounding a cavity.
2. Retropubic fat behind pubis.	2. Retropubic fat partly above pubis.
3. Empty bladder behind pubis.	3. Empty bladder partly above pubis.
4. Peritoneum passes from anterior abdominal wall to fundus of empty bladder, immediately above symphysis.	4. Peritoneum passes from anterior abdominal wall to fundus of empty bladder, 1½ inches above symphysis.
5. Urethra and bladder meet at a right angle.	5. Urethra and bladder almost in same line.

The reason why the pubic segment passes downwards when the vaginal orifice is opened, is that atmospheric pressure now acts on the vaginal aspect of the pubic segment (with its weak mesial attachment to the pubis) and drives it further down. As the result of this posture, changes take place in the length and direction of the vaginal walls and in the position of the uterus. These are briefly :—

1. *Vagina.*—(*a.*) Both walls elongate.
   (*b.*) The anterior follows the direction of the posterior aspect of the symphysis; the posterior, the curve of the sacrum.

2. *Uterus.*—(*a.*) The normally placed uterus passes nearer the sacrum and nearer the thoracic diaphragm.

(*b.*) The retroverted uterus, fixed or unfixed, becomes more retroverted.

(*c.*) The retroverted unfixed uterus does not become replaced so as to lie anteverted.

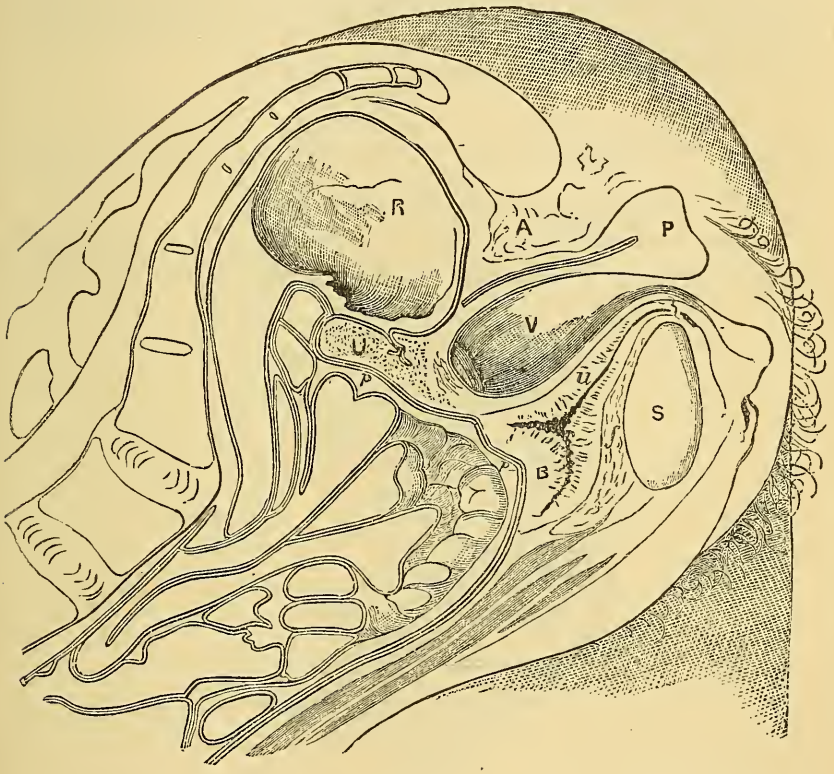

Fig. 65.

Pelvis in frozen section of cadaver in genu pectoral posture. *A*, anus; *P*, perineum; *R*, rectum; *V*, vagina; *u*, urethra; *B*, bladder; *S*, symphysis; *f*, retropubic fat; *U*, retroverted uterus; *p p*, peritoneum. Between the small intestine and peritoneum is fatty omentum (Simpson and Hart).

The results given have been obtained as follows:—

a. By observation on living patients, aided by silhouettes of the outlines of the nude body in the upright and genu-pectoral postures;

b. By study of frozen sections of the female pelvis, and especially by study of a frozen section of a cadaver placed in the genu-pectoral posture.

For further details on this subject Simpson and Hart's atlas may be consulted.

An important practical result follows from these observations. *The vagina dilates or, more properly, the segments of the pelvic floor separate, exposing their free margins—the vaginal walls—when a patient assumes the genu-pectoral posture and the hymeneal orifice is opened so as to admit air.* If a patient be so placed opposite a good light and the sacral segment be hooked up, a complete view of the vaginal walls and cervix is obtained. The same results can be got by placing the patient in the posture known as the *semiprone*. On this last fact is based the use of the vaginal speculum known as Sims' Duckbill speculum (*v.* Chap. X.).

THE EFFECT ON UTERINE POSITION OF DIGITAL PRESSURE IN THE VAGINAL FORNICES.

This is a subject of great practical importance.

If, when a patient is lying on her left side, the index finger of the examiner's right hand is passed into the vagina as far as the posterior fornix,

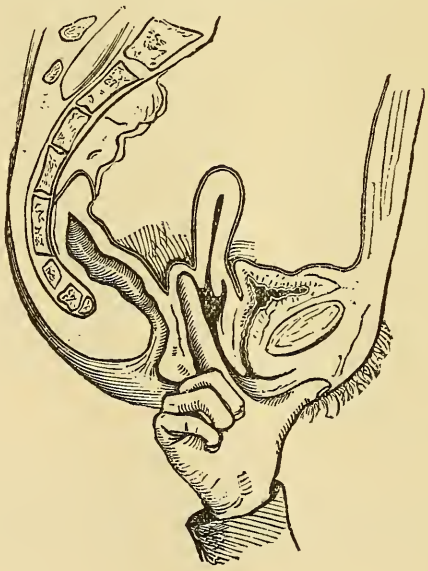

Fig. 66.

Anteversion being produced by digital pressure in posterior fornix.

and pressure made there in the direction of the antero-posterior axis of the fornix, the following results may be noted :—

(1.) The posterior vaginal wall is elongated, the cervix drawn back, and the uterus, if anteverted, becomes more so (Fig. 66).

(2.) If the uterus is retroflexed, the flexion is not remedied. Should the fundus be fixed, the retroflexion is increased as the cervix is drawn back while the fundus remains.

Similarly, if pressure be made in the anterior fornix :—

(1.) The uterus becomes elevated and slightly rotated backwards, because the cervix is pulled forwards (Fig. 67).

(2.) If the uterus is anteflexed, the flexion is not diminished.

By pressure in these fornices, therefore, we only act on the cervix,

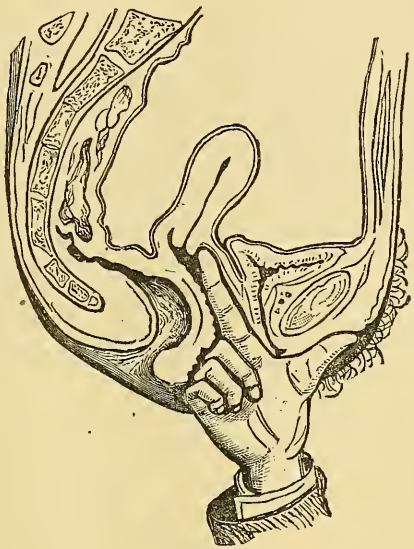

Fig. 67.

Retroversion of uterus produced by digital pressure in anterior fornix.

unless the uterus is very much retroverted or anteverted. The body of the uterus is acted on only indirectly, through its union with the cervix.

Consequently, no vaginal pessary can undo the flexion of a retroflexed or anteflexed uterus.

RELATION OF POSTURE TO EXAMINATION AND TREATMENT.

We have already mentioned several postures as being the proper ones for certain manipulations; and we here sum up briefly what it is of use to know in regard to these.

The *side-lateral*, where the patient lies on her side in the ordinary way, is convenient for vaginal examination ; passage of Fergusson's, Neugebauer's, or Cusco's speculum ; passage of the sound and catheter.

The *dorsal posture* is imperative for abdominal examination and the bi-manual.

The *semiprone* is the best posture for the passage of Sims' speculum; vesico-vaginal fistula operation.

The *lithotomy posture* is specially valuable for operations on the perineum, vaginal walls, cervix and uterus.

The *genu-pectoral posture* is useful for replacement of the retroverted uterus.

CHAPTER VI.

MENSTRUATION AND OVULATION.

LITERATURE.

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The subject of Menstruation is not as yet well known, and on many points eminent and trustworthy observers are at variance. So far as our present knowledge goes, the following is a brief *résumé*.

PRELIMINARY CONSIDERATIONS.

Definition.—A periodical flow of blood from the uterine cavity, with shedding of the superficial layers of its mucous membrane, accompanying the discharge of an ovum from the ovary, occurring in properly developed women between the ages of 14 and 44, and interrupted by uterogestation and lactation.

Period of its Onset.—Menstruation begins, in this country, usually at

the age of 13 to 15 (puberty). It may be delayed to 16, 17, or 20; but this is unusual. Its onset is earlier in warm countries, later in cold ones; earlier in delicately nurtured girls.

Period of its Cessation.—With the interruptions of pregnancy and lactation, it continues in healthy women until the age of 44 to 50. The period of its final cessation is known as the menopause. As a general rule the menopause is early when menstruation has begun early, and *vice versa.*

GENERAL PHENOMENA OF MENSTRUATION.

Changes at Puberty.—At this period of life, when the girl becomes the woman, we find certain well marked general changes occurring. The bust and mons veneris develop, and the whole contour of the body becomes more rounded and attractive; hair appears on the genitals. The romping carriage of the girl becomes subdued, and greater shyness characterises her conduct to the opposite sex.

Phenomena Premonitory to each Menstrual Flow.—There is usually a feeling of weight in the pelvis and increase of sexual inclination. Many women, however, have very little uneasiness during the whole flow; while others are always considerably distressed—this distress being still outside the boundary of actual disease.

Periodicity and Duration of Discharge.—When once established it recurs with great regularity every 28 days (in—71 p. c.), 30 days (in—14 p. c.), 21 days (in—12 p. c.), or 27 days (in+1 p. c.). We speak therefore of the 21 day *type* and so on. It lasts for a number of days, varying from 2 to 8. If below 2 or above 8 it is abnormal; but of course other points besides mere duration must be taken into account.

LOCAL PHENOMENA.

Three periods are distinguished:

1. Invasion,
2. Persistence,
3. Decline.

1. *Invasion.*—Discharge pale.

2. *Persistence.*—Discharge bright red, non-coagulable from its admixture with mucus. It consists microscopically of epithelium from vaginal,

cervical, and uterine cavities ; mucous globules ; compound granular corpuscles, and red and white blood corpuscles.

3. *Decline.*—Discharge lessens in amount and becomes lighter in color.

The total *quantity* varies from 2 to 8 ounces.

Thus far we have related facts fairly well ascertained and not much disputed. We now enter on more debateable ground, in considering—

I. Ovulation ;

II. The Corpus Luteum ;

III. Source of discharge and changes in the uterine mucous membrane.

I. *Ovulation.*—So far as our present knowledge goes, ovulation forms the starting-point of the process of menstruation. We have already considered the structure and development of the ovary, and now describe

The Changes in the Ovary at each Menstrual Period.—A Graafian follicle enlarges and moves nearer the surface. Probably this produces, through a nervous mechanism, a hyperæmia of the whole pelvic contents—peritoneum, connective tissue, uterus, ovaries, Fallopian tubes, and vagina. It is alleged, as yet on insufficient grounds, that the fimbriated end of the Fallopian tube grasps the ovary, and that the ovum from the ruptured Graafian follicle passes into it and along the tube to the uterine cavity. Professor Kinkead of Galway has recently advanced another explanation. He points out that, between the fimbriated end of the Fallopian tube and the ovary, we have the ovarian fimbria (Fig. 22) forming a groove which is converted into a tube by the surrounding viscera; and that consequently we have capillary action towards the uterus. This will lead the ovum into the Fallopian tube. However it may reach the Fallopian tube and uterus, its further development depends on its fertilization or non-fertilization. In the latter case it passes off unnoticed in the menstrual discharge ; in the former it develops into the fœtus.

II. *The Corpus Luteum.*—After the rupture of the Graafian follicle, we get its cavity filled up by the structure known as the corpus luteum.

The corpus luteum consists of a vascular framework, with a yellow pigmentary and cellular substance. It varies according as pregnancy does or does not follow its formation. The difference is well given in Dalton's table, which we subjoin.

	Corpus Luteum of Menstruation.	Corpus Luteum of Pregnancy.
End of three weeks...	12 by 13 mm. in diameter; central clot reddish, convoluted wall pale.	
One month.....	Smaller; convoluted wall bright yellow; clot still reddish.	Larger; convoluted wall bright yellow; clot still reddish.
Two months.....	Insignificant cicatrix.	12 by 22 millimetres in diameter; convoluted wall bright yellow; clot perfectly decolorized.
Four months.....	Absent or unnoticeable.	18 by 22 millimetres in diameter; clot pale and fibrinous; convoluted wall dull yellow.
Six months	Absent.	Still as large as at the end of the second month; clot fibrinous; convoluted wall paler.
Nine months	Absent.	10 by 13 millimetres in diameter; central clot converted into a radiating cicatrix; external wall tolerably thick and convoluted, but without any bright yellow color.

III. *Source of Discharge and Changes in the Uterine Mucous Membrane.*—All observers are agreed that the mucous membrane of the uterine cavity is the source of the discharge, *i.e.*, that it comes from the area limited by the uterine ends of the Fallopian tube and the os internum.

Now begins the divergence.

(1.) Williams holds that "uterine contraction drives the blood from the muscular wall into the mucous membrane; the vessels of this membrane, having undergone fatty degeneration, give way, and extravasation of blood results. This extravasation takes place always near the surface, for in that situation the degenerative change has most advanced. The rush of blood into the vessels of the mucous membrane expels the contents of the glands, together with the greater part of their lining epithelium. . . . When hemorrhage has taken place into the membrane, it undergoes rapid disintegration, and becomes entirely removed. . . ."

The new mucous membrane "is produced by proliferation of the elements of the muscular wall of the organ, the muscular fibres produ-

cing the fusiform cells, the connective tissue, the round cells, and the groups of round cells in the meshes formed by the muscular bundles, the glandular epithelium."

Entire removal of the mucous membrane and its regeneration from the muscular coat, are the essentials of Williams' views.

(2.) Kundrat and Engelmann describe the change at the menstrual period as follows :

Mucous membrane becomes swollen and pulpy, and measures in thickness 3—6 mm. The thickness is most marked at the fundus and central

Fig. 68.

Diagram of uterus just before menstruation. The shaded portion represents the mucous membrane (J. Williams).

Fig. 69.

Diagram of uterus when menstruation has just ceased, showing the cavity of the body deprived of mucous membrane (J. Williams).

portions of the anterior and posterior surfaces. The surface is puffy and injected ; glands are distinctly seen on section as fine spirals.

Microscopically, this increase in thickness is seen to be due to a proliferation of the round cells of the stroma, an enlargement of all the cell elements in the superficial layers, and an increase of the intercellular substance. This superficial layer has grown far above the original gland openings, causing the funnel-shaped depressions or small pits seen on surface view. The glands are increased in thickness and length. The vessels are enlarged and gorged with blood. Fig. 70 shows the mucous membrane of the menstruating uterus magnified 40 times ; it should be com-

pared with the mucous membrane of the non-menstruating uterus at Fig. 19, also magnified 40 times.

The increase of the thickness of the mucous membrane begins as the time of menstruation approaches, is most marked during the period itself, and gradually decreases after the cessation of the catamenial flow.

Fatty degeneration takes place in the cells of the interglandular tissue, blood-vessels, and glandular and surface epithelium.

They hold that "the hemorrhage is always confined to the surface of

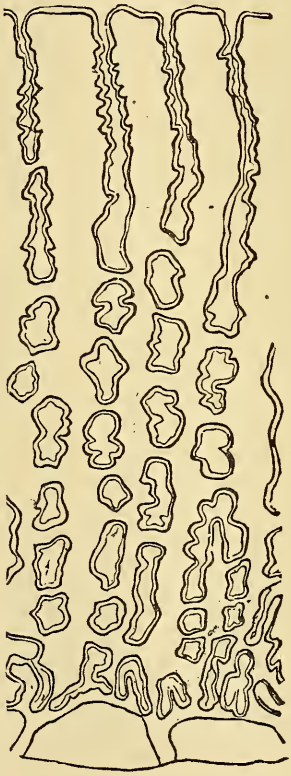

Fig. 70.

Mucous membrane of menstruating uterus ($^{40}/_{1}$, Kundrat and Engelmann).

the lining membrane, and is due to the fattily degenerated tissue being unable to resist the blood pressure;" and *they therefore maintain, what is most probably the case, that only the superficial layer of the mucous membrane is shed at a menstrual period.*

(3.) Leopold denies the existence of any fatty degeneration of the

superficial layers of the mucous membrane. He believes that an extravasation of red and white blood-corpuscles from the superficial capillaries takes place especially towards the superficial layer, undermining the uppermost layer of cells; and that, finally, the copious supply of blood reaching these capillaries from the numerous arteries causes rupture and bleeding. The mucous membrane is regenerated by an upward growth of the glandular epithelium.

Williams, Kundrat, Engelmann, and Leopold examined uteri from *post-mortem* cases. Recently Möricke has curetted the uteri of living women at various stages of their menstruation, and microscopically examined what he removed. He asserts that "during menstruation the mucous membrane disappears neither partially nor fully." This shows how widely microscopists vary. Williams says all the mucous membrane is removed; Kundrat, Engelmann, and Leopold say only the superficial layers are removed; and Möricke says none is removed.

We have deemed it best to lay these views before the student. The subject is difficult to investigate, and one on which the authors are not qualified to give an opinion. They incline, however, to the views of Kundrat, Engelmann, and Leopold. The chief difficulty in regard to Williams' view is the regeneration of the new mucous membrane from the muscular coat.

Finally, it should be noted that almost all observers consider *ovulation* and *menstruation* as occurring together. Beigel's view, that ovulation occurs at any time and that menstruation is a mere evidence of sexual excitement, has found no supporters.

A dispute still exists as to which ovum is fertilized when pregnancy occurs—the ovum of the bleeding period, or that of the first period missed. Many observers believe in Loewenhardt's theory, viz., that the ovum fertilized is that of the first period missed.

Lately the dominant influence of the ovary in menstruation has been questioned by some, notably by Lawson Tait. The operation known as Battey's operation, where both ovaries are removed, does not always cause a cessation of menstruation. Tait asserts that menstruation will always cease if the Fallopian tubes are also excised; and therefore believes that they play an important part in menstruation, hitherto unsuspected.

Leopold's monograph is illustrated by many valuable lithographs, and the same may be said in regard to Dalton's work on the Corpus Luteum.

SECTION II.

PHYSICAL EXAMINATION OF THE FEMALE PELVIC ORGANS.

In this section we have to take up the physical examination of the female pelvic organs, that is exploration by the hands and instruments of the gynecologist. This will be considered in the following manner:

Chapter VII. Abdominal Examination: Vaginal Examination: the Bimanual Examination, with its various modifications.

Chapter VIII. Examination per Rectum.

Chapter IX. The Volsella.

Chapter X. Vaginal Specula.

Chapter XI. The Uterine Sound.

Chapter XII. Sponge Tents and other Uterine Dilators.

Chapter XIII. The Curette.

Chapter XIV. Knives, Scissors, Needles, Sutures, Antiseptics, Douches and Syringes, Anæsthetics.

CHAPTER VII.

ABDOMINAL EXAMINATION: VAGINAL EXAMINATION: THE BI-MANUAL EXAMINATION WITH ITS VARIOUS MODIFICATIONS.

In a female patient whose symptoms point to a pelvic cause, it is necessary to investigate the case by what is commonly known as a vaginal examination. A mere vaginal examination, however, gives very little information. The proper method is first to make an external abdominal examination and then the vaginal examination, the latter being only a stage of the more complete method of investigation known as the bi-manual. Special cautions as to cases unsuitable for pelvic exploration are given under the head of vaginal examination. We consider the examination in the following order :—

I. External abdominal examination.
II. Inspection of external genitals (only when necessary).
III. Vaginal examination.
IV. The bi-manual or abdomino-vaginal examination.

EXTERNAL ABDOMINAL EXAMINATION.

The patient should lie on her back with her knees drawn up and her head supported on a pillow. The bowels and bladder should be empty. The abdominal surface should be bared and exposed from the epigastrium downwards; no part of the mons veneris should be uncovered. The most delicate method of accomplishing this is as follows: A sheet or blanket should be thrown over the recumbent patient; beneath this she should raise up her dress as far as the pit of the stomach; the examiner then places his one hand on the sheet, a little above the mons veneris, and turns it down over it with his other hand. The abdominal surface is examined in four ways, viz., inspection, palpation, percussion, auscultation.

A. *Inspection.*—The form, color, equality or inequality of bulge of the

abdominal surface should be noted; the presence or absence of the linea nigra, lineæ albicantes (fresh and old), pigmentary deposits, fat streaks, and skin eruptions. The linea nigra has no significance. The lineæ albicantes indicate that the patient's abdominal cavity is or has been distended beyond the normal. They are not specially significant of pregnancy. Fresh lineæ albicantes are glistening and pearly; old ones have a dull white or scarred appearance.

B. *Palpation* should be performed with both hands. For this purpose the hands, well warmed, are laid flat on the abdominal surface and the whole area manipulated between them. One hand alone is of no use. By this method the abdominal contents are compressed and driven between the hands. The feeling given normally is that of manipulating a plastic fluid. Tapping with one index finger so as to give a fluctuating impulse to the other hand is of great value. Circumscribed nodules or tumors, fluid collections, thickening of the skin, should be noted and mapped out on the scheme given in the chapter on case-taking.

For the more exact localization of the normal and abnormal abdominal contents, anatomists divide the anterior abdominal surface into definite regions by vertical and transverse lines. The lower transverse line is drawn at the level of the anterior superior iliac spines; the upper one, between the most prominent parts of the ninth costal cartilages. A vertical line joining the cartilage of the eighth rib with the middle of Poupart's ligament on each side, completes the division into nine areas, which are named in order as follows (*vide* Plate I.).

Right Hypochondriac (5).	Epigastric (4).	Left Hypochondriac.
" Lumbar (7).	Umbilical (6).	" Lumbar.
" Iliac (9).	Hypogastric (8).	" Iliac.

In these regions the following structures are found:—

Epigastric region.—Right part of stomach; pancreas; liver.

Right Hypochondriac.—Right lobe of liver; gall-bladder, part of duodenum; hepatic flexure of colon; part of right kidney, and its suprarenal capsule.

Left Hypochondriac.—Cardiac end of stomach; spleen and narrow extremity of the pancreas; the splenic flexure of the colon; the upper part of the left kidney, with the left suprarenal capsule; sometimes also a part of the left lobe of the liver.

Umbilical.—Part of the omentum and mesentery; the transverse part of the colon; lower part of the duodenum, with some convolutions of the jejunum and ileum.

Right Lumbar.—The ascending colon; lower half of the kidney; and part of the duodenum and jejunum.

Left Lumbar.—The descending colon; lower part of the left kidney, with part of the jejunum.

Hypogastric.—The convolutions of the ileum; the bladder in children, and, if distended, in adults also; the uterus when in the gravid state.

Right Iliac.—The cæcum, with the appendix vermiformis, and the termination of the ileum.

Left Iliac.—The sigmoid flexure of the colon. (*Quain.*)

Plate III. shows a valuable coronal section, published by Ruedinger; it should be carefully studied. The numbers refer to the following structures:

1. Right lung. 2. Right auricle; to its left is the larger coronary vein. 4. Right branch of pulmonary artery. The shorter left branch is seen at the left. 7. Liver. Note the impression on its under and right side from the right flexure of the colon. 8. Stomach. Note how its long axis is vertical and that the main bulk of the stomach is to the left of the middle line. 9. Ascending colon. 9*. Opening of small intestine. 10. Small piece of junction between stomach and duodenum. 11. Pancreas. 12. Duodenum. 13–13. Small intestine. 14. Fundus uteri. 15. Bladder, with ureteric openings. 16. Connective tissue. 17. Descending colon. 18. Sigmoid flexure. 19. Mesentery.

In palpating the normal abdomen, the sensation given is one of impulse communicated generally through a plastic fluid. When free fluid is in the abdominal cavity the impulse is more distinct. When the fluid is encysted, the impulse and tense feeling are localized.

When any large body is felt in the abdominal cavity, the first point to be determined is whether the body is pelvic or abdominal. This is easily done by attempting to press the hand downwards just above the symphysis pubis. If the tumor is pelvic and rising up into the abdomen, the hand cannot be so pressed; and conversely.

In all tumors, the existence or non-existence of intermittent contractions should be carefully noted. Their presence indicates a uterine tumor—pregnancy or soft fibroid.

The following general points should be kept in mind. The bladder is only in the hypogastric region when distended or displaced upwards: if empty it is behind the pubis, and in the true pelvis: a distended bladder may be as large as a six months' pregnancy. Ovarian tumors are more or less lateral; uterine tumors generally central, although the pregnant uterus has usually a right lateral obliquity. In advanced pregnancy, the parts of the fœtus can be distinctly palpated. Finally, it should be kept in mind that in all cases of cystic tumors the catheter should be passed into the bladder, for an obvious reason.

Case.—Mrs. A. was sent for consultation as to removal of internal tumor. On examination, a cystic tumor was felt mesially in the abdomen and reaching up to umbilicus. Vaginal and bi-manual examinations were exceeding painful. A catheter passed into the bladder evacuated a large amount of urine. The uterus was now found to be retroverted and gravid 3½ months, and the cystic tumor had disappeared.

C. *Percussion* is to be performed in the usual way. To perform this thoroughly, the patient should be percussed (*a*) when on her back; (*b*) when on her left side; (*c*) when on her right side; (*d*) when sitting up. Changes in the percussion note on the patient changing her posture should be carefully noted as they are of great value (*vide* under Ovarian Tumours and Ascites).

D. *Auscultation* is of great value, and is performed with the ordinary stethoscope. The fœtal heart, uterine souffle and friction may be heard by it. The importance of auscultation is evident. Fœtal heart-sounds indicate pregnancy; the point of greatest intensity of the heart-sounds indicate the lie of the child. Uterine souffle and no heart-sounds indicate either pregnancy and child dead, or fibroid tumor. Ovarian cysts have no souffle.

Before finishing abdominal examination, the patient should be made to raise her shoulders by grasping the examiner's hand. When there is no encysted abdominal tumour the recti can be seen to flatten the abdominal contour; if, however, a solid or cystic tumour be present the contour is unaltered. An exception should be made in the case of thin-walled cysts with fluid of a low specific gravity, where the recti do flatten the contour as in the former case.

INSPECTION OF EXTERNAL GENITALS.

This should not be made a routine practice. As a general rule, inspection of the genitals should only be made when there is local tender-

ness, where syphilis or gonorrhœa is suspected, or where it is said by the patient that something comes down at the vaginal orifice. Soft chancres, hard chancres (almost never seen in females), mucous patches, condylomata; urethral caruncles; irritable spots causing vaginismus; labial abscess; parturition tears of perineum and labia; prolapsed pelvic organs; external or internal piles, may be found.

VAGINAL EXAMINATION.

Preliminaries.—Vaginal examination should not be made on girls below or little beyond the age of puberty, unless the symptoms are urgent, *e.g.*, mechanical retention of menstrual fluid from atresia. In the case of unmarried women it should not be performed unless specially necessary. In both classes of patients the value of a rectal examination should be kept in mind. The vaginal examination should be made on married women whose symptoms point to a pelvic cause. Finally, no woman should be examined vaginally when menstruating normally, unless under exceptional circumstances.

After settling these preliminaries and having obtained the patient's consent to "examine" (a term understood by all women as meaning a vaginal examination), the next point is to determine the position the woman is to occupy while the examination is going on.

In this country it is customary to place the woman on her left side for the vaginal examination, and to turn her on her back for the performance of the bimanual. The patient, therefore, lies on a convenient couch with her knees well drawn up and her clothes loose. The examiner carefully oils or soaps the index and middle finger of his right hand. With his left hand he clears away the clothes from the hips so as to make a passage for the examining fingers, which he passes onwards till he reaches the cleft between the buttocks. He next passes them forwards over the anus, skin over base of perineum and fourchette, until the pulp of the finger rests at the vaginal orifice. In multiparous women, the lax vaginal orifice is easily felt. When in doubt, the student should pass his fingers cautiously on until he touches the vestibule, which is always smooth. Passing his fingers back he will then reach the vaginal orifice at the base of the vestibule.

The student must be careful not to pass his finger into the rectum by mistake. He should remember that the vaginal axis passes backwards, the anal axis forwards; that no force is required to pass his finger into

the vagina of a woman whose hymen has been ruptured, whereas some force is necessary to overcome the resistance of the sphincter ani in all women. The clitoris, lying at the apex of the vestibule, should never be touched digitally.

The two fingers being now at the vaginal orifice should be carried backwards into the vagina until its upper limits are felt. While doing so the student should note—

1. *State of vaginal orifice;* patulous or narrow, presence or absence of painful spots, presence or absence of spasm.

2. *Walls;* presence or absence of rugæ; moisture, heat, secretion, tumours attached to them; fistulæ; foreign bodies such as pessaries, glycerine plug, oakum plug; shape of walls, length of walls.

3. *Cervix;* direction, size, shape, and consistence. Note especially if thickened, expanded, and fixed; drawn to one or other side; or if mobile and not fixed; or if split and with cicatrices radiating from it to vaginal roof.

4. *Os;* size, shape, consistence of lips. Thus it may be a dimple as in nulliparæ; transverse as in parous women (Figs. 13 and 14); or the cervix may be split on one or both sides and thus no *os externum* is present, but the cervical canal is more or less exposed (Plate VIII.). Bodies projecting through it should be noted. They may be polypi, fragments of abortion, cancerous masses, stem pessaries.

5. *Posterior fornix* is concave when felt from below. It has normally a feeling like that of the inside of the angle of the mouth. Note if any lump can be felt through it, projecting down from Douglas pouch, rendering the fornix convex. A body or a feeling of resistance in the posterior fornix may be—

(1.) Fæces;
(2.) Acute or chronic inflammatory deposit, cicatrization of utero-sacral ligaments;
(3.) Retroverted fundus uteri;
(4.) Blood effusion;
(5.) Fibroid attached to posterior wall of uterus;
(6.) Ovary inflamed or cystic;
(7.) Ascitic fluid;
(8.) Extra-uterine fœtation or hydatid (rare).

6. *Anterior fornix.*—Note if there is any body felt through it. If so, it is most probably the fundus uteri, normal or enlarged from pregnancy

or fibroid. There may be also inflammatory or blood effusion, or a tender ovary, but these are rare here.

7. *Lateral Fornices.*—Note cicatrices, prolapsed or cystic ovary, lateriflexed uterus, inflammatory or blood effusion in broad ligament, dilatation of Fallopian tubes, fibroids placed laterally.

The vaginal examination has now been completed. The student should keep in mind that he really learns very little from a vaginal examination, just as he can learn very little as to the size and relation of any object by touching it with the fingers on a but limited area. Vaginal examination is thus only the preliminary to the bimanual or abdomino-vaginal.

BIMANUAL OR ABDOMINO-VAGINAL EXAMINATION.

This method of examination is the all-important one in gynecology and is the one which the student and practitioner will find most valuable, so that its practice should precede all other methods of internal investi-

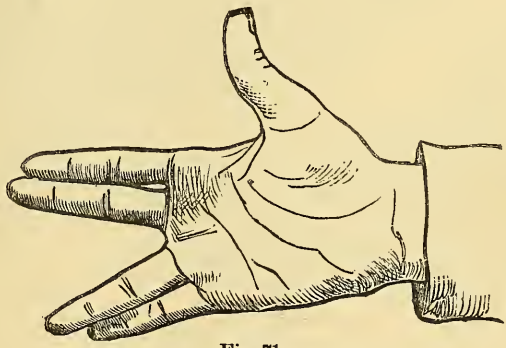

Fig. 71.

Right hand as in bimanual examination.

gation. As the practitioner's experience increases, he will find that he relies more upon this and becomes less dependent on other means of examination.

Method of performing Bimanual. Position of Patient.—The patient must now be made to lie on her back. The head and shoulders should be supported and the knees drawn up.

Arrangement of Examiner's Hands.—The *internal* hand (the right) is placed as follows: two fingers (index and middle) are in the vagina, the thumb rests in the fold between a labium majus and the thigh, and the other fingers lie in the cleft of the nates, Fig. 71. The whole hand is

then rotated backwards so as to bring its long axis as nearly as possible into the axis of the brim, and is then pushed up towards the brim of the pelvis. Thus the pubic segment, uterus with annexa, and posterior vaginal wall are lifted up towards the brim. The middle finger is placed over the os and the index one in the anterior fornix, so that the uterus as it is pushed up becomes more anteverted. The right hand while examining, therefore, has the appearance at Fig. 71. The little and ring fingers may be doubled up as in Fig. 72. The external hand (the left) is placed on the abdominal wall just above the pubis, with its long axis

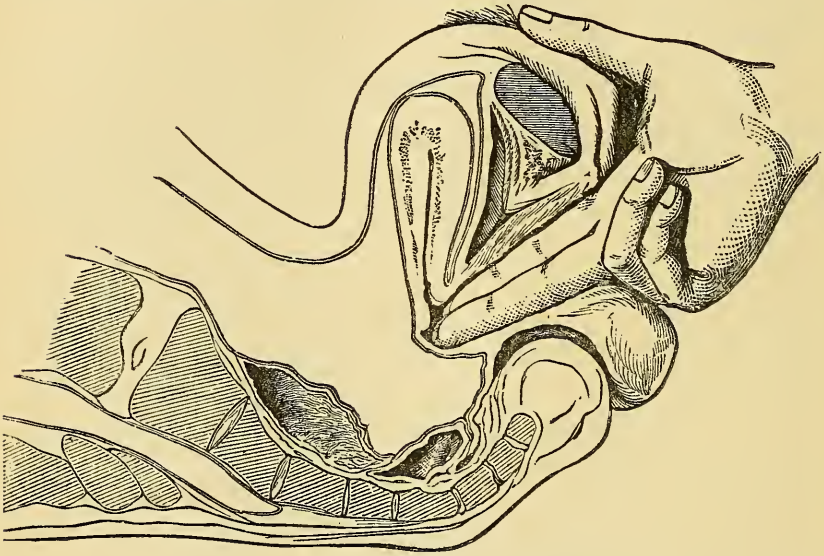

Fig. 72.

Bimanual examination. The upper hand is not shown (Hart).

running obliquely between the iliac crests, its ulnar edge near the promontory and much deeper than the radial one. It is now steadily depressed until the abdominal wall below it is markedly cupped (Figs. 72 and 73) and moulded over the uterus, ovaries, etc., which have been elevated by the inner hand. In this way the two hands estimate the size and relations of the pelvic contents, just as one would estimate the size of a watch covered with a cloth. The student should note specially that the upper hand should be steadily and not spasmodically depressed; that he should always keep the ulnar edge of this hand deeper, that is, nearer the sacrum, so that he may not retrovert the uterus; and that he should palpate all the abdominal areæ along the pelvic brim so as not to miss

anything. *His first object in the bimanual examination is to determine where the uterus is,* as this greatly simplifies the recognition of abnormal products in the pelvis. He then bimanually explores the fornices, moving the internal fingers appropriately and noting what he feels. At first his diagnosis should be simply bimanual, *e.g.*, "uterus felt to front and a

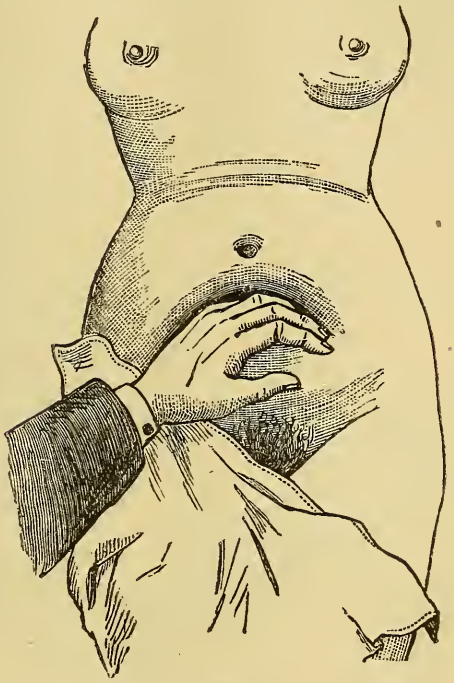

Fig. 73.

Anterior abdominal surface of female, with upper hand placed for bimanual (*ad naturam*).

large firm lump behind it;" or, "uterus felt retroverted and a small movable tumor on its left side."

It is of importance that the student should know what a "normal bimanual" is. The following is a description of the condition found in a nulliparous married woman, on vaginal and bimanual examination:

"Ostium vaginæ patulous, and admits two fingers; vaginal walls moist, rugous, with no abnormalities. Vaginal portion of cervix normal in size (Fig. 13); os uteri felt like a dimple, looking downwards and backwards. No bodies are felt through the lateral and posterior fornices, which are concave on their vaginal aspects and have the feeling, on pressure, of the angle of one's mouth. In the anterior fornix a body is felt,

which on bimanual examination is discovered to be the uterus lying to the front and not enlarged. The fundus and cervix meet at a very large angle. Bimanual exploration of the fornices reveals nothing distinctly palpable.[1] The patient complains of no pain during the whole examination, and has no symptoms referable to the pelvis."

Cases where the Bimanual is difficult.—The student will soon find that the bimanual can be performed in certain cases with great facility and accuracy, while in other women it is exceedingly unsatisfactory.

The best case for a bimanual is a woman a fortnight or three weeks after delivery. The reasons for this are evident. A puerperal woman has

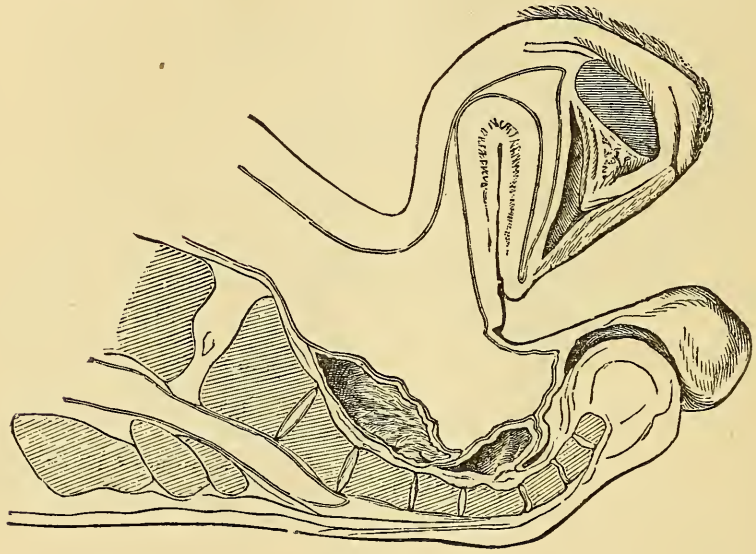

Fig. 74.

Displacement of pelvic floor segments and abdominal wall in bimanual (Hart).

had the ostium vaginæ and vaginal walls relaxed by the child's head; the pubic segment has been drawn up and its attachments slackened; the abdominal walls have had their elasticity diminished by the full time uterus, and the uterus itself is not involuted to its normal size. In such a case there are evidently all the requisites for a good bimanual.

Difficult bimanual cases are found in stout nulliparous women, and in cases of pelvic inflammation. In such, the rectal examination, with or without the use of the volsella, is indicated.

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[1] One practised in the bimanual can feel the normal ovaries.

Students at first find their bimanual unsatisfactory. By perseverance, however, they will obtain by means of it an accuracy in diagnosis which is astonishing. It is not only the best means of investigation, but one from which no possible harm can arise. In no cases is it contra-indicated except those of advanced cancer or of acute inflammation.

We have described the simple abdomino-vaginal examination. It will be readily understood that we may have others, as follows :

(1.) Recto-abdominal (finger in rectum and left hand above) ;

(2.) Recto-vagino abdominal (middle finger in rectum, index finger in vagina, and left hand above) ;

(3.) Vesico-vagino-abdominal (middle finger in vagina, index in bladder, and hand above).

Of these the third is very rarely practised.

Note that in the Bimanual the pubic segment with uterus and its annexa are elevated, the sacral segment shortened, and the abdominal walls depressed (Fig. 74).

After the bimanual or other examination is finished, the examiner should scrupulously cleanse his hands. There are no better nor cheaper substances for this than turpentine and ordinary soap, as Dr. Foulis of Edinburgh has shown. The odor is by no means disagreeable, and if found objectionable can be easily covered by vinegar which in itself is a good cleanser. In examining cancerous cases, where the odor is exceedingly penetrating and persistent, it is a good plan to dip the fingers in turpentine prior to the examination.

CHAPTER VIII.

EXAMINATION PER RECTUM.

LITERATURE.

Hegar—Die operative Gynäkologie, zweite Auflage : Stuttgart, 1881 : *Mundé*—Minor Gynecology : Wood & Co., New York, 1881. Consult Hegar for additional references.

The results obtained by a vaginal examination are limited by the fact that the reflection of the vaginal walls to form the fornices, prevents the finger being pushed up to a sufficient distance. This defect is compensated for by the downward pressure of the upper hand in the Bimanual ; but in those other cases where the abdominal walls are unyielding and the pubic segment stiff, due pelvic exploration by an abdomino-vaginal examination alone is impossible. In such cases, rectal exploration and the abdomino-rectal or abdomino-recto-vaginal examination are invaluable. They give better information than the more commonly practised abdomino-vaginal.

The usual methods are—

(1.) Simple rectal ; abdomino-rectal ; abdomino-recto-vaginal.

(2.) Passage of the *whole* hand into the rectum (Simon's method).

SIMPLE RECTAL ; ABDOMINO-RECTAL ; ABDOMINO-RECTO-VAGINAL.

Preliminaries.—The patient should be told that it is necessary to examine the bowel. If the rectum is loaded the examination should be deferred till next day, and the patient instructed to use a purgative at night and an enema in the morning.

The following points should be especially noted :—The examiner should thoroughly soap the fingers and nails. A vaginal examination may be made first ; and then, the index finger being kept in the vagina, the middle one is passed into the rectum (Fig. 75). If the patient is virginal and it is wished to avoid a vaginal examination, then the index finger alone is passed into the rectum. When the finger or fingers are with-

drawn from the rectum the hands should be at once cleansed; there can be nothing more hurtful to a patient's feelings than the passing of the uncleansed fingers from the rectum into the vagina. The patient lies first on her left side and then on her back.

The finger passed into the rectum goes forward; when passed into the vagina, the direction is backwards. After overcoming the resistance of the strong external sphincter it enters the rectal ampulla (Fig. 36), which is often expanded by flatus. Passing the finger onwards and to the left

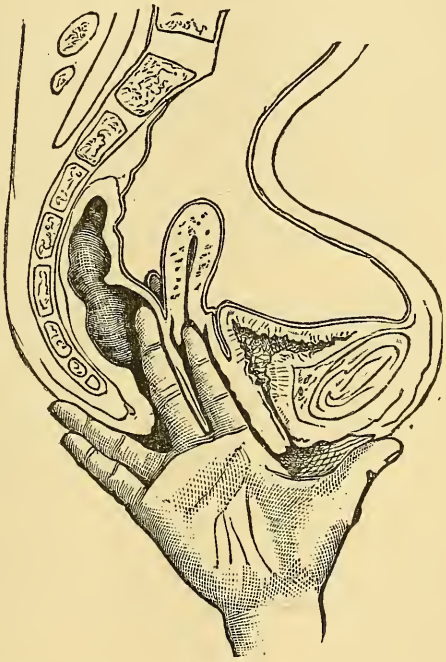

Fig. 75.

Abdomino-recto-vaginal examination. Upper hand not shown. Note prolapsed ovary.

side, a confused mass of tissue is felt in which we may detect the opening betwixt the segments of the sphincter tertius.

As we pass the finger inwards we note piles (internal and external), fissures, polypi, ulcers, stricture (specific and malignant).

We next turn the pulp of the examining finger so that it lies on the anterior rectal wall. Through this can be felt the cervix. Note that the whole cervix is felt, which is much larger than the vaginal portion felt on vaginal examination. Be sure not to mistake it for the body of the uterus. If the uterus lies to the front its forward direction can be noted;

if to the back, then the body will be felt on passing the finger further up. Pushing the finger well upwards and passing it first to the right and then to the left, we feel the ovaries (more distinctly when enlarged) as small oval tender bodies (Fig. 75).

Fig. 40 shows a common condition of the uterus which is constantly mistaken for and treated as a retroversion. We allude to the uterus anteflexed and drawn back by pelvic cellulitis of the utero-sacral ligaments. As the patients are usually sterile and have therefore somewhat unyielding abdominal walls which cause a difficult bimanual, and as a lump is felt in the posterior fornix, the diagnosis of retroversion is often made. The rectal examination, however, clears up the case, as the finger feels the knee of the flexion and the fundus going forward from it.

The *upper hand* is used during the rectal examination just as in the bimanual, *i.e.*, the examination is abdomino-recto-vaginal or abdomino-rectal. The simple rectal (with the finger in the rectum unaided by the other hand) does not give much information as to the condition of the uterus.

Where, from rigidity of the abdominal walls, it is difficult to press down or fix the uterus with the external hand, this may be done with the volsella in the vagina. The use of the volsella enables us to draw the uterus better within reach of the finger in the rectum. This examination per rectum aided by the volsella will be considered in the next chapter.

Of all manual examinations of the pelvis, the abdomino-rectal or abdomino-vagino-rectal is the most thorough. In retroversions, prolapsed ovaries, and pathological anteflexion, it should never be omitted. A patient may object to it and refuse to allow it; and, of course, the practitioner must keep this in mind.

SIMON'S METHOD OF PASSING THE HAND INTO THE RECTUM.

This consists in passing the whole hand through the sphincter ani into the rectum, and even up to the transverse colon. The patient is deeply narcotized; the hand is passed cautiously through by inserting first two fingers and the others successively until the entire hand is passed; incision of the sphincter ani may be necessary. Sometimes an incurable incontinence of fæces has resulted.

The unanimous opinion of gynecologists is that this severe method of

examination is unnecessary. Careful bimanual examination, aided when necessary by anæsthetics, gives equally good results.

For specialists it is of use to know that valuable results in minute precise rectal examination can be got by first injecting air into the rectum. The whole rectum up to the sigmoid flexure can be dilated, the sphincters made out and the bony pelvic wall carefully explored. It is necessary to add, however, that this is an adjunct to the rectal method of examination of use only in certain instances.

CHAPTER IX.

THE VOLSELLA.

LITERATURE.

Goodell—Some Practical Hints for the Treatment and the Prevention of the Diseases of Women: Medical and Surgical Reporter, January, 1874. *Hegar*—Zur gynäkologischen Diagnostik: Die combinirte Untersuchung, Volkmanns Sammlung, No. 105. *Simpson, A. Russell*—The Use of the Volsella in Gynecology: Contributions to Obstetrics and Gynecology, p. 183.

We have already seen that one of the most striking anatomical features and properties of the uterus is the considerable range of its mobility in almost every direction. It can be pushed upwards from its normal position 1½ or 2 inches, and is displaceable forwards or laterally in a very marked degree. If laid hold of with the instrument known as a volsella, it can be drawn downwards (by a force not exceeding five or six pounds) until the os externum lies close to the vaginal orifice. This procedure facilitates, in suitable cases, diagnosis and treatment of gynecology so much that it is well worthy of the allotment of a special chapter to its discussion. We take up—

1. Description of instrument;
2. Method of use;
3. Mechanism of the displacement it causes;
4. Uses;
5. Contra-indications.

1. *Description of Volsella.*—At Fig. 76 is seen the useful volsella employed by Russell Simpson. As it is generally the anterior lip of the cervix that is laid hold of, the slight pelvic curve given to the blades is unnecessary since the volsella lies along the straight anterior vaginal wall. Fig. 77 shows Hart's volsella, where this straightness of the blades *quâ* the vagina is secured, and the handle and fingers of the gynecologist are kept away from the vaginal orifice by the bend on the handle. Every volsella should have a catch on it. Sometimes it is useful to have an in-

strument whose blades pass over one another, so as to separate for instance the lips of a split cervix : such is Hank's instrument.

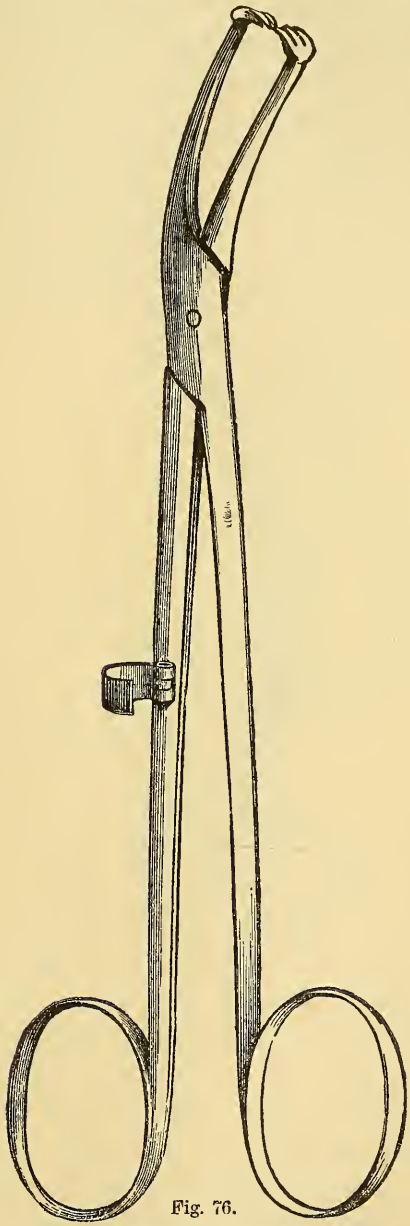

Fig. 76.

Professor A. R. Simpson's volsella, with catch.

2. *Method of Use.* (*a.*) *Without previous passage of Speculum.*—The patient is placed in the ordinary left lateral posture. Two fingers of the

right hand are passed into the vagina and the anterior lip of the cervix touched. The volsella, held in the left hand, is guided along between the index and middle exploring fingers ; the anterior lip of cervix is seized and drawn down. Rectal examination is now made. (*b.*) *With the Speculum.*—For this, see Chapter X.

3. *Mechanism of Displacement it causes.*—The uterus is drawn down so as to lie behind the symphysis pubis. If drawn down fully, as it may be

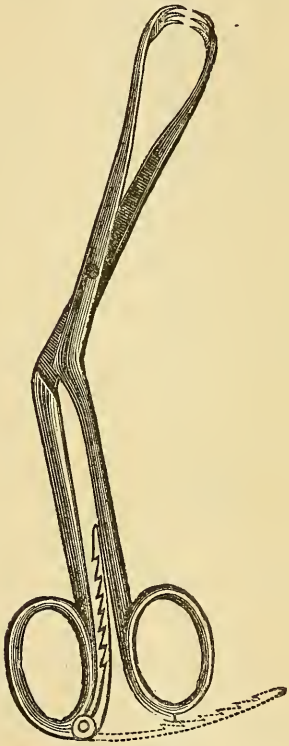

Fig. 77.

Dr. Hart's volsella.

in exceptional cases, it has its long axis in the vagina and the os externum near the vaginal orifice.

The vaginal walls are inverted, *i.e.*, when the os externum is at the vaginal orifice we have a deep pouch behind and in front of the uterus.

The relations of the bladder and rectum are given in Fig. 78.

4. *Uses.* (*a*) *In Diagnosis.*—(1.) The cervix which may seem "ulcerated," as it is commonly called, is easily demonstrated by the volsella, to be

singly or doubly lacerated. For this purpose the anterior and posterior lips are laid hold of, and when brought together the ulceration is seen to be due to laceration with eversion.

(2.) Abdominal tumours can be shown to be connected with the uterus or not as the case may be. If the patient be placed in the dorsal posture and the tumour be laid hold of by an assistant, then when the uterus is drawn down, the tumour can be felt to descend if fixed to it.

(3.) To the examination *per rectum* the volsella is a valuable addition. If one finger be placed in the rectum, and the cervix laid hold of with a volsella and drawn down, the mobility of the uterus can be estimated; if it be anteflexed by cicatrized utero-sacral ligaments, these can be felt tense

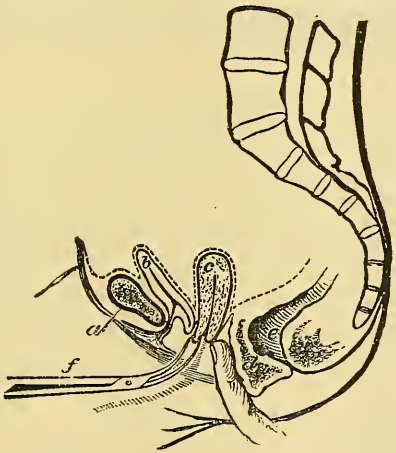

Fig. 78.

Mechanism of displacement of pelvic floor segments when volsella is used (A. R. Simpson). *a*, symphysis pubis; *b*, bladder; *c*, uterus; *d*, perineum; *e*, rectum; *f*, volsella.

(Fig. 40); the whole posterior uterine surface may be palpated for small fibroids. The ovaries are made more accessible; and the uterus, especially if small, can have its length estimated by the rectal finger.

This method of examination of the uterus by rectum and volsella, judiciously conducted, is of the very greatest value.

It is evident that it will also help one as to the diagnosis of displacements of the uterus; but its value in this respect is somewhat lessened by the displacement its use causes. Thus it makes a retroversion less retroverted; an anteflexion less anteflexed; an anteversion less anteverted.

(*b*) *In Treatment.*—In this the volsella is one of the most useful instruments the gynecologist possesses. Thus it helps greatly in the examina-

tion of the aborting uterus; in replacement of the gravid or non-gravid retroverted uterus; in insertion of sponge and tangle tents, or stem pessaries. In operations such as Emmet's for repair of the cervix, Sims' division of the cervix, amputation of vaginal portion of cervix, excision of the uterus through the vagina for cancer, it is indispensable.

Details on its uses in these cases will be given under the special descriptions of the operations; and it will also be shown in the chapter on specula, that by using the volsella the speculum may be dispensed with in certain cases.

5. *Contra-indications.*—It should not be used in acute peritonitic or cellulitic attacks, in distended Fallopian tubes, in hæmatocele or in ad-

Fig. 79.

Sims' tenaculum.

vanced cancerous disease. No pain should be caused by its use provided that only the vaginal aspect of the cervix is laid hold of.

The amount of traction to be made will vary with the necessities of the case. In many instances only a mere steadying action is requisite; in others the cervix has to be drawn half-way down the vagina. In special cases the cervix is drawn down to the vaginal orifice or beyond it, as in amputation of the cervix or excision of the uterus. For simply steadying the cervix, Sims' tenaculum is of service (Fig. 79).

CHAPTER X.

VAGINAL SPECULA.

LITERATURE.

Barnes—Op. cit. *Goodell*—Op. cit. *Hart*—Structural Anatomy, op. cit. *Mundé*—Op. cit. *Sims, J. Marion*—Clinical Notes on Uterine Surgery: Hardwicke & Co., London, 1866. *Thomas*—Op. cit.

We have already seen that the segments of the pelvic floor are separable when a woman assumes certain postures; that the sacral segment can be hooked up, and that by this means we get a view of the vaginal boundaries of these segments and of the os uteri. This is the natural method of opening up the pelvic floor; or the natural specular method.

Gynecologists had used various instruments for enabling them to look into the vagina; but all of these proved unsatisfactory until Marion Sims, noting the natural postural dilatation of the vagina, introduced his famous duckbill speculum.

We take up the consideration of four typical specula, viz.:—

1. The duckbill, or Sims speculum,
2. The tubular, or Fergusson speculum.
3. The Neugebauer and its modifications,
4. The bivalve of Cusco.

We note under each its nature, the method of employing it, and the theory of its action and uses.

1. The Sims or duckbill speculum is shown at Figs. 80, 81, and Plate V.

Its Nature.—Each instrument in reality consists of *two specula*, which are of different size and connected by a handle; usually, however, we speak of these specula as the *blades* of the *speculum*. The real Sims' speculum is light, has each blade slightly concave on its anterior aspect, and has the blades at *right* angles to the intermediate handle.

Modifications of Sims' speculum are numerous. Indeed it seems difficult for gynecologists to resist modifying an instrument, and very rare

to find them improving it. The most widely known modification is Bozeman's; it is heavier than Sims', has the blades meeting the handle at an acute angle, and the blades more concave on the anterior aspect. (Figs. 81 and 82.)

One curious fact about almost all specula is, that they are too long.

Fig. 80.
Sims' speculum.

Sims' blade is 4 inches long, though the posterior vaginal wall measures only $3\frac{1}{2}$ inches. Thus, as we wish to expose only the anterior vaginal wall and cervix uteri, a 3-inch length of blade is sufficient.

A modification of Sims' speculum, by Dr. Battey of Georgia, is worthy

Fig. 81.
Sims' speculum.

Fig. 82.
Sims' speculum modified by Bozeman.

of note. It has one short blade which meets the handle at a more acute angle. (Fig. 83.)

The Method of employing Sims' Speculum.—Under this it is important

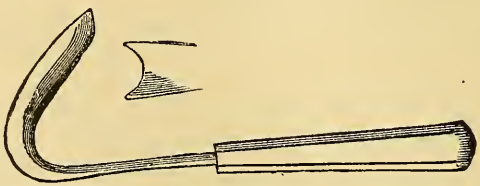

Fig. 83.
Battey's speculum.

to note: (*a*) How to place the patient, (*b*) How to pass the speculum, and (*c*) How to hold it when passed.

(*a.*) *How to place the Patient.*—The patient must be placed in the Sims

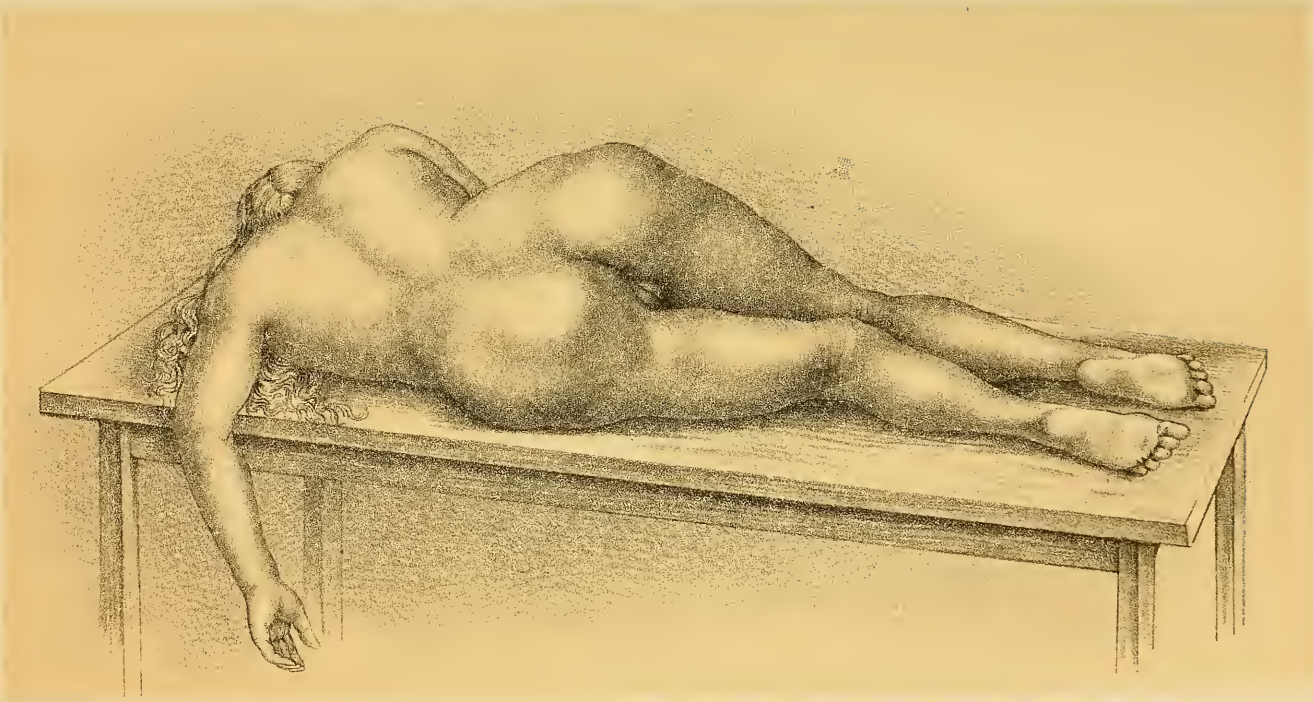

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PLATE IV — FEMALE CADAVER IN SEMI-PRONE POSTURE (DRAWN FROM NATURE.)

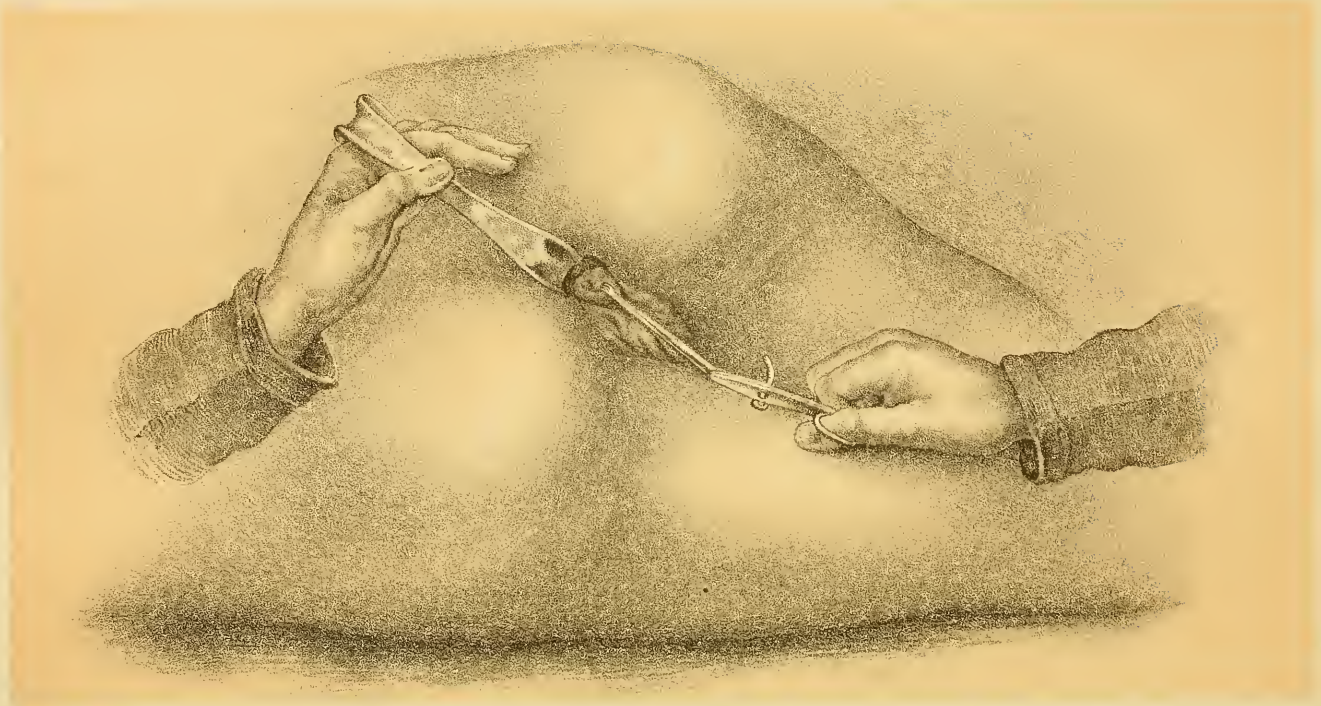

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PLATE V — FEMALE CADAVER IN SEMI-PRONE POSTURE, WITH SIMS' SPECULUM PASSED, AND UTERUS DRAWN DOWN WITH A VOLSELLA.

or in the semiprone posture. This is briefly as follows. The patient lies almost on the breast: *the lower left arm is over the edge of the couch* next the gynecologist: the hips are close to the edge: the knees are well drawn up; and *the upper or right knee touches the couch with its inner aspect.* The posterior aspect of the sacrum is therefore oblique to the horizon. (Plate IV.)

As the result of this posture—a modified genu-pectoral one—the vaginal walls separate when air is admitted; the pubic segment passing down with the viscera, the sacral one remaining behind.

(*b.*) *How to pass the Speculum.*—Choose the blade which is of the proper size to pass the vaginal orifice; warm it, and oil it with the fingers on its convex aspect only. The concave surface must be dry to reflect light, and therefore the speculum should never be oiled by dipping it. Hold it by

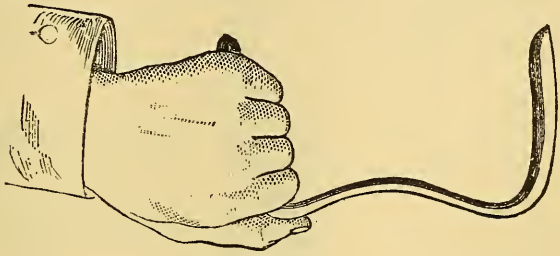

Fig. 84.

One method of holding Sims' speculum.

the other blade in the left hand, as shown at Fig. 84. Then pass the index and middle fingers of the right hand into the vagina to separate the labia; carry in the speculum between them; push it onwards, following the curve of the posterior vaginal wall, until the beak of the instrument lies on the posterior fornix. Now draw the instrument back as a whole, in a direction at right angles to the posterior vaginal wall; then turn the beak forwards, so as to bring the cervix more into view. Finally tilt the blade, so that the beak lies on a lower level than the proximal end of the blade: this keeps up the upper labium.

(*c.*) *How to hold the Speculum when passed.*—Plate V. shows the speculum passed, and a convenient way of holding it. When passed, the cervix may be drawn down with a volsella (also shown in Plate V.). Various attempts have been made to add to the Sims speculum a means of rendering it self-sustaining; the majority of these are by no means successful, and therefore we need not describe what is seldom used. The knowledge

of a simple method of effecting this in Battey's speculum is of use. This has a piece of indiarubber, with a hook at the end attached to the handle, which can be fastened in the pillow, sheet, or patient's dress; the cervix is drawn down with a volsella held in one hand, leaving the other free for minor manipulation.

Theory of Action and Uses of the Sims Speculum.—The Sims speculum is based on the effects consequent on the genu-pectoral posture. When the patient is semiprone and the vaginal orifice opened, the segments of the pelvic floor separate; and then the Sims speculum is a simple means of hooking the sacral segment well back.

The Sims speculum is, on the whole, by far the most useful speculum. It is difficult to manipulate at first, but amply repays practice. Its discovery has been one of the greatest strides in gynecology. In vaginal and cervical operative surgery, it is the only speculum that can be used.

2. The Fergusson Speculum is seen at Fig. 85. It is made in three

Fig. 85.

Fergusson speculum.

suitable sizes; and may be described as a glass tube, with a proximal trumpet and a distal bevelled end. It is made of glass silvered internally and coated on the outside with caoutchouc. The bevelling of the distal end makes a shorter anterior side and a longer posterior one. The maker's name is usually placed at the trumpet end just at the foot of the anterior side, and serves to indicate that side when the speculum is in the vagina.

Mode of Employment of the Fergusson Speculum.—The patient lies in the left lateral position with hips raised. Warm the speculum, and oil it

on the outside. Take it by the trumpet end with the right hand and pass it into the vaginal orifice previously opened up by index and middle fingers of the left; now push it in, short side to the front, until arrested. By looking along it, the practitioner can note if the cervix is in view. It is generally not so, but may be snared by the following manœuvres; carry the trumpet end well back towards the perineum and then depress the distal end first to the left and then to the right, finally turning it round if these fail. In multiparæ with lax vaginæ it is easy to pass the Fergusson; but it is more difficult in nulliparæ.

The Fergusson is a favorite speculum with many. It is useless in

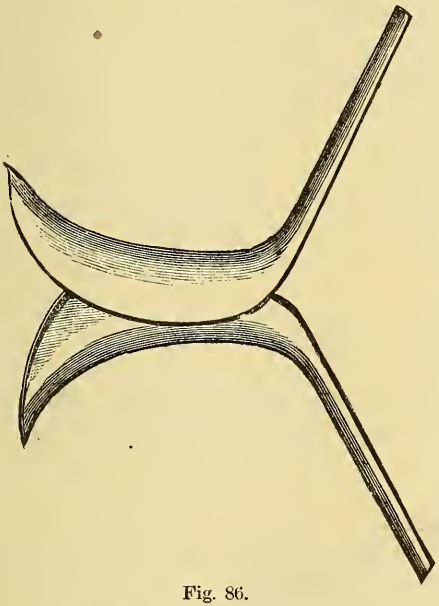

Fig. 86.
Neugebauer's speculum when passed.

Fig. 87.
Cross section showing relation of blades; the upper is posterior.

vaginal and cervical surgery, but with it applications to the cervix can be made very well and easily. When used for making applications to the endometrium, it is advisable to pull the cervix well down with a volsella after the speculum is passed, and to use a straight sound covered with cotton wool.

3. The Neugebauer is like a Sims speculum divided transversely at the middle of the handle (Fig. 86). It is also made in suitable sizes.

Mode of Employment.—Warm and oil *two* blades. Introduce one blade (the broader one) with its convexity touching the posterior vaginal wall.

Then introduce the other with its convexity touching the anterior vaginal wall and so that its edges fit within the edges of the posterior vaginal

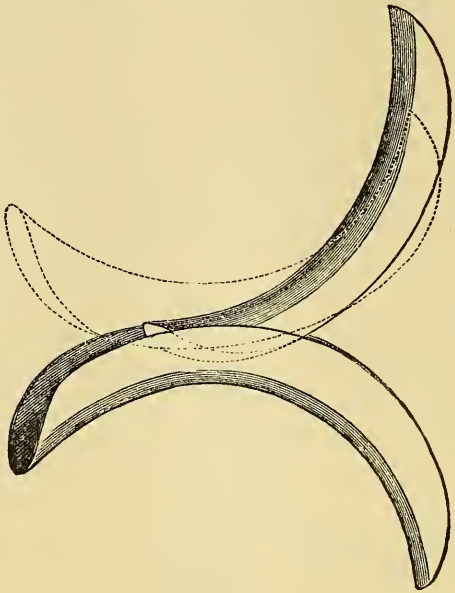

Fig. 88.

Barnes' crescent speculum.

wall blade (Fig. 87). The beak of the posterior blade is thus in the posterior fornix; that of the anterior blade in the anterior fornix. From

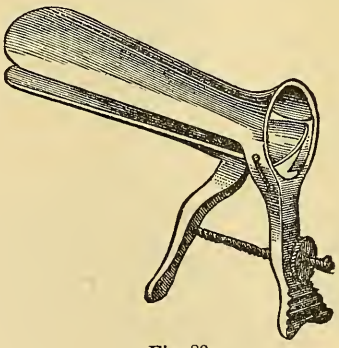

Fig. 89.

Cusco's speculum.

their contact a leverage is obtained on separating the handles, by which traction is made on the fornices and the cervical canal more or less everted.

Fig. 88 shows a useful modification of this by Barnes, known as the Crescent speculum.

The Neugebauer and Crescent specula are useful in making cervical and endometric applications, and are better specula than the Fergusson.

4. The Cusco or Bivalve speculum is shown at Fig. 89. It is composed of two blades jointed on to one another at their bases. The blades are opened to the desired distance by pressure on the thumb-piece and kept open by a screw. It is introduced with its blades right and left and then turned so that they lie anterior and posterior, that with the screw being posterior. It is then pushed onwards, and the blades opened and fixed by the screw.

Care should be taken not to catch any of the perineal hairs in the screw; and, in withdrawing it, not to pinch up the vaginal walls.

The Cusco speculum is self-retaining and useful in cervical and endometric applications.

If the patient be placed in the genu-pectoral or semiprone posture, the posterior vaginal wall hooked back with the finger and the cervix drawn down with a volsella, a useful view can be obtained without the aid of any speculum.

USES AND COMPARATIVE VALUE OF THE VARIOUS SPECULA.

The Sims is undoubtedly the best and most scientific speculum we possess. When properly used and aided by the volsella, it leaves nothing to be desired. For operative cases its use is imperative; and it is the only speculum which does not distort the split cervix. It is objected by some—on insufficient grounds—that it is difficult to manipulate, requires a skilled assistant, and exposes the patient unduly.

The Fergusson is easily passed, involves only slight exposure, and is good in very minor gynecology. It gives only a limited view of the vaginal walls. The student should note that it brings the flaps of a split cervix together and somewhat conceals the lesion.

The Neugebauer, on the other hand, opens up the cervical split, and may do this so effectually as to give the impression that there is none. The Fergusson, Cusco, and Neugebauer are all *self-retaining*.

CHAPTER XI.

THE UTERINE SOUND.

LITERATURE.

Simpson, Sir J. Y.—Memoir on the Uterine Sound, Selected Obst. Works : A. & C. Black, Edinburgh, 1871. See *Mundé's* Minor Gynecology and *Thomas* as to Huguier & Lair.

In considering this important gynecological instrument, we take up—

1. Its nature :
2. Preliminaries to its use ; when not to use it :
3. Method of use ; difficult cases :
4. Employment for diagnosis and treatment :
5. Dangers attending its use :
6. Relation to bimanual and rectal examination.

NATURE.

The sound of Sir James Simpson is not only the classical instrument, but, taken all in all, is probably the best. We describe it, therefore, as a type of the instrument, and then consider its modifications.

Simpson's sound is a rod of flexible metal 12 inches long, specially graduated and provided with a suitable handle (Fig. 90). It is made of copper, nickel-plated ; this is sufficiently pliable to be moulded and yet sufficiently stiff to retain any special shape given to it. Instrument-makers often make this sound too unyielding. It should be always pliable enough to be bent with two fingers.

The handle has the shape shown at Fig. 91. Note that it is roughened on the same side as that towards which the point of the instrument lies. Consequently, when the sound is in the uterus, we can tell the direction of the point by noting this roughness on the handle.

The graduation is important. $2\frac{1}{2}$ inches from the point is a rounded knob : this is the length of the fully developed unimpregnated uterine

cavity. Other markings are at 3 inches, 4½ inches, 5½ inches, and so on up to 8½ inches. The notch, 1½ inch from the point, is of little use and weakens the instrument.

The modifications of this instrument are numerous. The changes are chiefly in its flexibility, lightness, and in the use of another material.

Prof. A. Russell Simpson has modified the instrument by making it

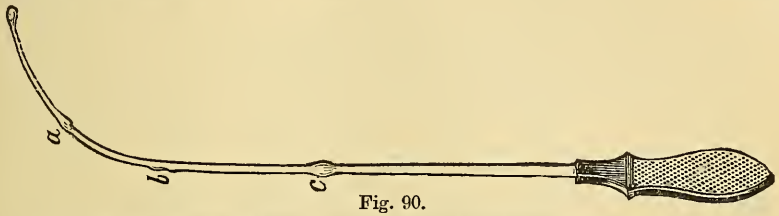

Fig. 90.

Sir J. Y. Simpson's sound. The 1½ in. notch is not shown. *a*, 2½ in. knob.

shorter, abolishing the 1½ inch notch, and squaring the handle (Fig. 91): this gives a very handy and useful instrument. Sims, Emmett, and Thomas have each a special sound. Thomas' is made of hard rubber or

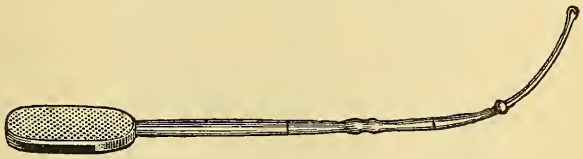

Fig. 91.

Russell Simpson's sound.

whalebone, and he claims that it is specially useful in the case of submucous fibroids. Other modifications are by Mathews Duncan, Protheroe Smith, Aveling, Jennison, Hanks, &c.

PRELIMINARIES TO ITS USE.

No instrument should have the preliminaries to its use more carefully considered. The rash and careless use of the sound may do immense mischief to the patient. Note then *when not to use it:*

(1.) The sound is not to be passed during an ordinary menstrual period.

(2.) It is not to be passed in an acute inflammatory attack of uterus, ovaries, pelvic peritoneum, or connective tissue.

(3.) It is not to be passed in cases of cancer of the cervix or body of the uterus.

(4.) It is not to be passed if the patient has missed a menstrual period. This is a safe rule, but admits of limitation as we shall see afterwards.

Before using it—

(1.) Ascertain that the patient has not missed a period.

(2.) Do the bimanual carefully. If in doubt, use the rectal examination aided by the volsella.

(3.) Place the patient in the left lateral posture.

(4.) Give the sound the curve you find the uterus to have.

METHOD OF USE.

After the preliminaries mentioned above, take the sound in the hand and oil its first 3 inches with carbolic oil 1–20. Pass the two fingers of

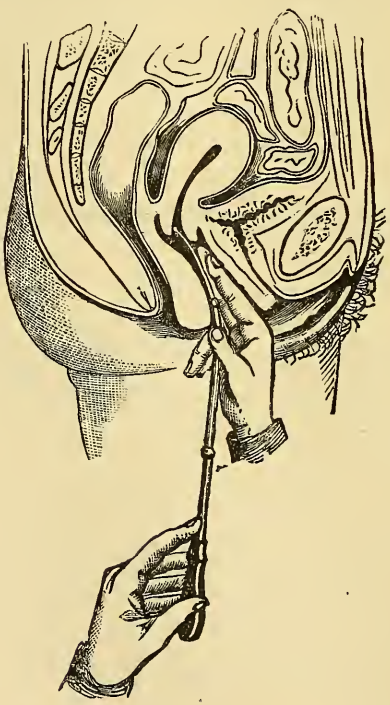

Fig. 92.

First stage of passing the sound.

the right hand into the vagina and touch the anterior lip of the cervix, *i.e.*, in front of the os. Guide the sound along the vaginal fingers and

make the point enter the os uteri (Fig. 92). Pass it in for an inch or so, to fix it.

If the uterus be retroverted then carry the *handle* towards the symphysis, when the point of the instrument will glide into the uterine cavity until arrested by the fundus (Fig. 93). No force is needed. If force

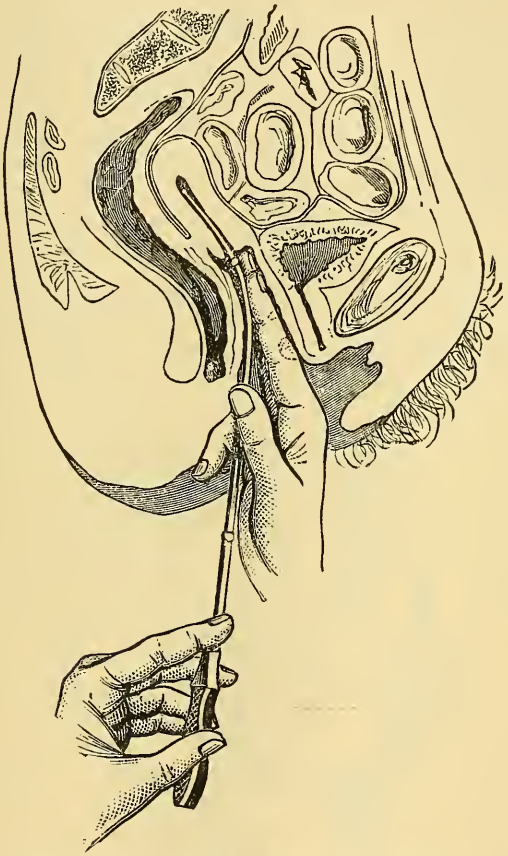

Fig. 93.

Second stage of passing the sound when uterus is retroverted.

seems necessary, the instrument should be withdrawn and a more careful bimanual performed.

If the uterus lie to the front, the procedure is different. Pass the sound as already described until it has entered the cervix for an inch or so (Fig. 92). Note now that the point of the sound looks back, whereas the fundus lies to the front. Clearly we must make the point look to the front. This is done by turning the handle so that the roughened surface

looks to the front. To do this we do not twist round the handle on its long axis, but make it sweep round the arc of a wide semicircle as in Fig.

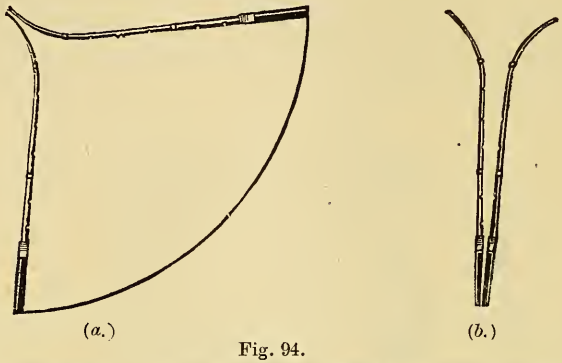

Fig. 94.

a, Proper method of turning the sound, contrasted with improper method, *b*.

94. The point, during this manœuvre, remains fixed or nearly so. Now carry the handle back to the perineum when the point glides into the cavity (Fig. 95).

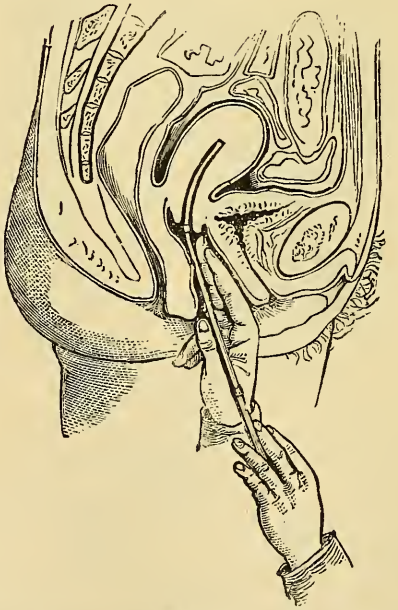

Fig. 95.

Second stage of passing the sound when uterus is to the front.

Another way of passing the sound, when the uterus lies *to the front* is as follows. Place the patient well across the bed. Do bimanual and

curve sound appropriately. Take the sound in the right hand. Pass two fingers of the left hand, palmar surface forward, into the vagina and touch the posterior lip of the cervix. Carry the sound, point looking forwards, into the vagina ; make it enter the os and then carry the handle towards the perineum, when the point will glide on. This method avoids the

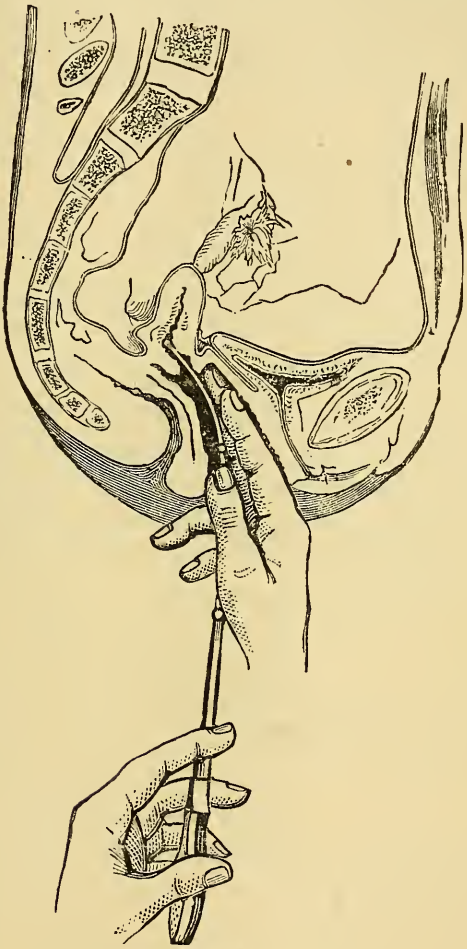

Fig. 96.
Sound arrested (before rotation) in a case of anteflexion.

sweeping round of the handle, and is useful if the uterus is very much anteverted.

The sound may be passed after the uterus is drawn down with a volsella, or after the Sims speculum has been introduced.

Difficult Cases.—These are chiefly found in markedly anteflexed uteri.

The sound passes in so far (Fig. 96), but when turned has its point looking too directly upwards. In such cases first draw the cervix down with a volsella, now pass the sound, and should it still stop at the flexion make pressure with a finger in the anterior fornix to push up the fundus. Then get an assistant to carry the handle of the sound towards the perineum.

When the uterine cavity is tortuous, as in submucous fibroids, a gum elastic bougie—No. 10—may be used to ascertain the length of the uterine cavity. Thomas', Jennison's, or Emmet's sound is specially useful here.

EMPLOYMENT OF THE SOUND FOR DIAGNOSIS AND TREATMENT.

(*A*) Diagnosis.

(1.) *Length of uterine* cavity. This varies in different pathological conditions. Thus the cavity is

(*a*) lessened in Superinvolution of uterus,
Atrophic uteri;

N.B.—The sound easily perforates the thinner wall of the superinvoluted uterus. This does no harm. It may also pass along the Fallopian tube.

(*b*) increased in Subinvolution of uterus,
Hypertrophy of uterus,
Cervical hypertrophy,
Endometritis,
Submucous fibroids,
Interstitial fibroids,
Small uterine polypi,
Prolapsus uteri.

(2.) *Direction of uterine axis;* whether retroverted, anteverted, lateriverted.

(3.) *Relation* of axis of uterine body to that of cervix, whether we have anteflexion or retroflexion.

(4.) *Stenosis and atresia at os internum and os externum; tenderness of fundus*, as in endometritis.

(5.) *Mobility of uterus.* This should be ascertained in the following way. Pass the sound as already described. Make the patient turn on her back, and then place two fingers in the vagina, palmar surface upwards, and

touching the posterior lip of the cervix. The sound lies on the palm of the hand, is steadied with the thumb, and can be used to move the uterus gently about as desired. When the uterus is not easily defined by the upper hand in the bimanual, the sound, passed and used as just indicated, enables the upper hand to map it out better. Prof. A. Russell Simpson's sound is specially useful for this manœuvre, as the shortness of the stem and the form of the handle allow the latter to lie flat on the palm.

(6.) *Rough condition of endometrium ;* often associated with bleeding when sound is passed.

(7.) *Differential diagnosis between uterine polypi projecting into vagina, and inverted uterus, etc.*—When we have a polypus to deal with, the sound passes in through the cervix for more than the usual distance because the uterine cavity is enlarged. In inversion it passes for only a short distance into the cervix, and is then stopped by its reflexion. Sometimes, however, the neck of the polypus is adherent all round to the cervical canal, thus simulating inversion ; and in some very rare cases the mucous membrane of the uterus becomes separated and expelled from the uterine cavity, simulating inversion of the whole uterus, owing to the separation stopping at the os internum. It is evident that in these last two cases the bimanual clears up the diagnosis, the upper hand feeling the body of the uterus in its normal position in both of them. The sound is only confirmatory of the bimanual.

(B) Treatment.

(1.) *Rectification of undue angular relation between the uterine body and cervix* (anteflexion, retroflexion) : *dilatation of uterine canal as a whole, or of stricture at os internum.*

(2.) *Replacing of retroverted unfixed uterus.*

(3.) *Application of acids to endometrium on the sound covered with cotton wool.*

DANGERS ATTENDING ITS USE.

The great dangers to the patient from the passage of the uterine sound are abortion and abrasion of the mucous membrane, with absorption of septic matter and resulting pelvic cellulitis or peritonitis.

The former untoward result must be very carefully guarded against. One valuable caution is never to omit the question as to the menstruation, and to ask if it was the usual amount. Some women have a slight discharge

of blood at the first period after they conceive, some even menstruate during the whole period of utero-gestation. The best safeguard is the careful performance of the bimanual. This soon teaches the practitioner to know whether he has an unimpregnated uterus between his hands, or one at the second or third month of gestation. Special care should be taken when the uterus is retroverted: it may be also gravid; and the pregnancy may, by causing pressure, have induced the patient to consult a medical man. As the bimanual is often difficult, an unwary use of the sound may make the diagnosis disagreeably evident.

The means to avoid setting up any inflammatory disturbance are—to perform the bimanual carefully, to curve and oil the sound properly, and to pass it gently.

SOUND COMBINED WITH BIMANUAL.

The importance of this method of examination has been recently pointed out by Professor A. Russell Simpson, in a paper read to the Edinburgh Obstetrical Society. For its performance the short sound with the square handle (Fig. 91) is necessary. It is of such a length that, when the middle finger is at the knob, the flat surface of the handle rests on the ball of the little finger, against which it is steadied by the flexed little and ring fingers.

The sound is introduced into the uterus in the ordinary way. The fingers are passed into the vagina as for a vaginal examination, and the sound grasped as in Fig. 97. The thumb rests on the symphysis pubis. While the middle finger steadies the sound, the index is in the anterior fornix, and the external hand placed as in the ordinary bimanual.

This method is specially useful (*a*) when the uterus is flaccid; the sound stiffens it, and enables the external hand to define it: (*b*) when, from the presence of small fibroids or pelvic deposits, there is doubt as to what is the fundus uteri; the sound, felt by the external hand in the uterus, indicates the fundus.

RELATION OF SOUND TO BIMANUAL AND RECTAL EXAMINATION.

Before Sir James Simpson introduced the use of the sound, gynecological examination was confined to the exploration of the vagina and cervix.

Simpson gave an immense impulse to gynecology by placing in the

hands of gynecologists an instrument which explored the uterine cavity above the cervix, and thus enabling them to obtain a perfection of diagnosis before undreamt of; thus gynecological examination was made up of a vaginal examination, and then a passage of the sound, due attention being given to the non-existence of pregnancy. J. Y. Simpson recom-

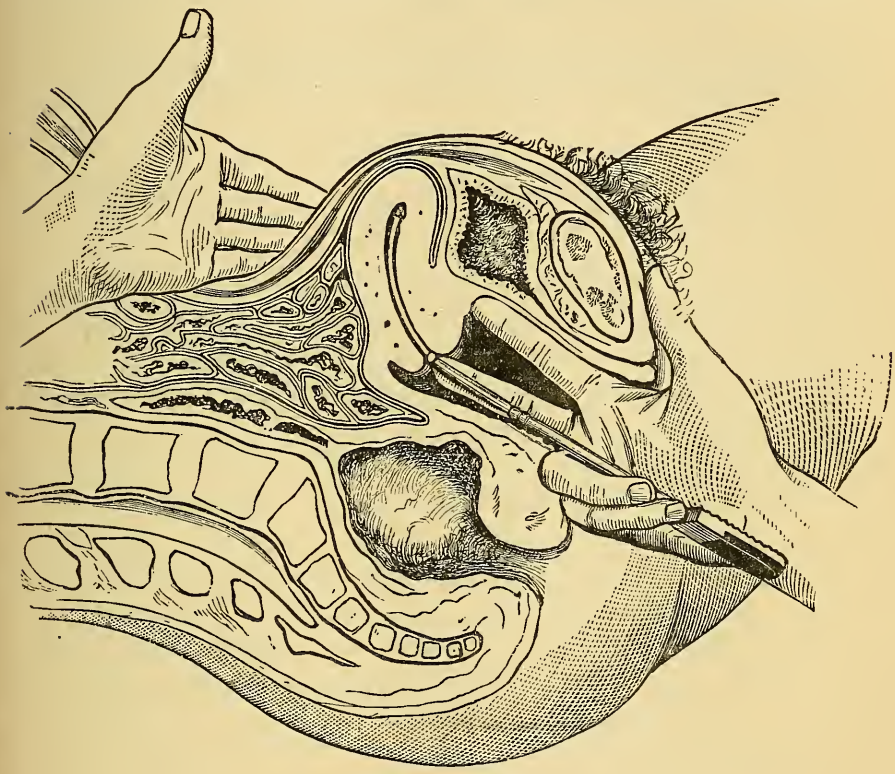

Fig. 97.

Sound combined with bimanual examination.

mended, further, the elevation of the uterus with the sound, and its definition with the upper hand.

The next step in gynecology was the use of the two hands—the bimanual and rectal examinations—which in the last twenty years has developed immensely. Consequently, the use of the sound has become more limited. The teaching in this chapter has been based on a recognition of this fact, inasmuch as the use of the sound is recommended only after the bimanual, rectal, and volsellar examinations have been carefully employed.

CHAPTER XII.

THE SPONGE TENT AND OTHER UTERINE DILATORS.

LITERATURE.

Simpson, J. Y.—Op. cit. *Sims, J. M.*—Op. cit. *Landau*—Ueber Erweiterungsmittel der Gebärmutter: Volkmann's Sammlung No. 187. *Mundé*—Op. cit.

Hitherto we have considered only the means which have placed the vagina and cervix within range of digital examination. In this section we take up the methods by which we get digital examinations of the uterine cavity—methods of the highest practical value, which, like the sound, we owe to the genius of Sir James Simpson.

We therefore consider—

I. *Means of slowly dilating the Cervical Canal by Sponge Tents, Tangle Tents, Tupelo Tents;*

II. *Means of slowly dilating the Cervical Canal by graduated hard rubber Dilators—Tait's, Hank's;*

III. *Means of dilating the Cervical Canal by incision and screw Dilators;* this last will be described under Sims' operation for pathological anteflexion.

Under each we take up—

1. Material or instrument,
2. Purposes for which used,
3. Preliminaries to and method of use,
4. Dangers and contra-indications to use.

DILATATION BY SPONGE, TANGLE, AND TUPELO TENTS.

1. *Material.*—The sponge tent is a cone of good, unbroken, thoroughly dried sponge, impregnated with some antiseptic and then firmly compressed into small transverse bulk, its original length being preserved. When thus prepared and placed under conditions where it can absorb

moisture, it swells up and in thus expanding dilates any dilatable structure which may grasp it.

Good sponge tents of various sizes may be had from all chemists. In order to prevent the antiseptic from volatilizing, the sponge tents are covered with grease. They are provided with a tape at the base to aid their extraction from the cervix after use.

Tents are also made from the ordinary sea tangle (laminaria digitata) (Fig. 98) and from tupelo wood (nyssa aquatilis). It is alleged that the

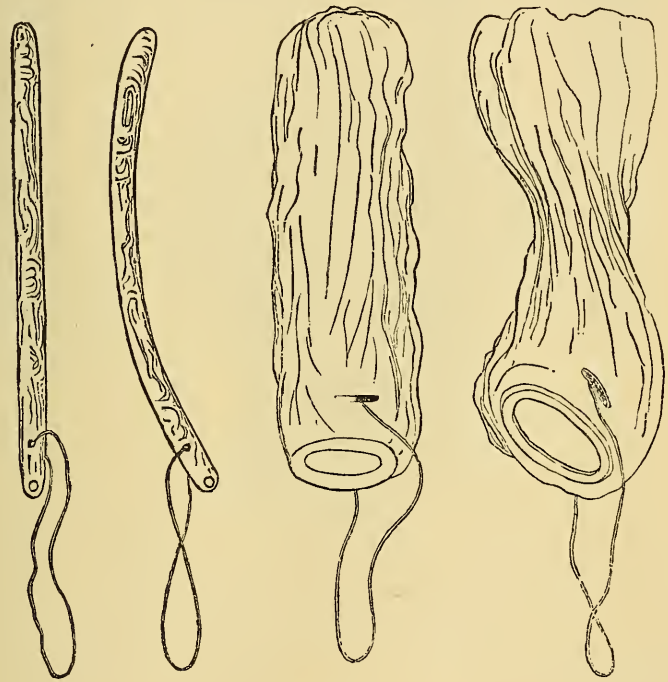

Fig. 98.

Shows on the left a straight and a curved laminaria tent and on the right these tents after expansion. Note how one has been gripped by the os internum (Mundé).

tupelo extends more rapidly than either tangle or sponge. Fig. 99 shows its power in this respect. Tangle tents may be had hollow; this facilitates the imbibition of moisture but weakens their expanding powers.

2. *Purposes for which used.*—Sponge tents are used as follows:

(1.) To restrain hemorrhage in cases of abortion and at the same time dilate the cervix for further interference;

(2.) To dilate the cervix and uterine cavity and enable the practitioner to ascertain and remove the cause of pathological uterine hemorrhage, whether due to endometritis, sarcomata, polypi, or incomplete abortion;

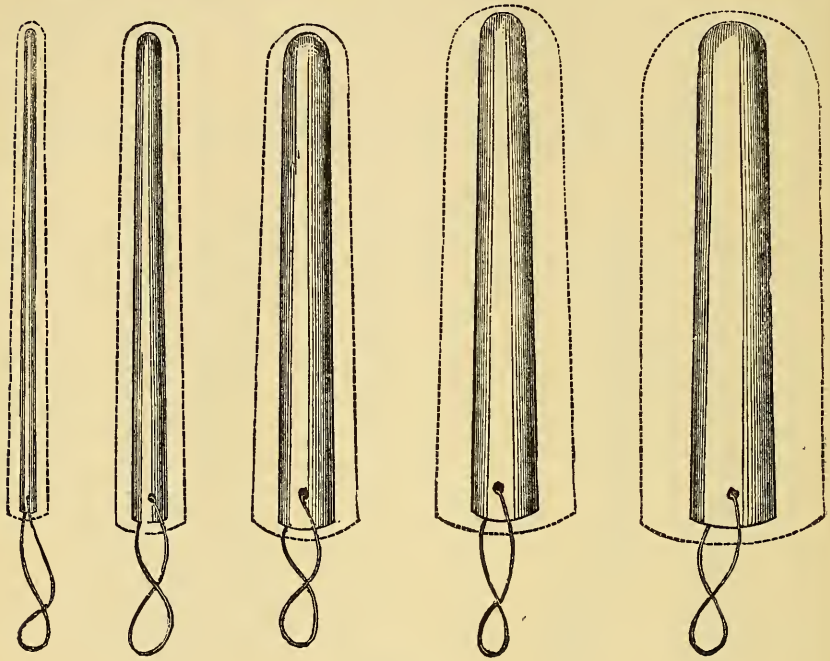

Fig. 99.

Diagram to show relations between size of tupelo tent, before and after expansion. The dotted outside line indicates the size of the tent after expansion (Mundé).

(3.) To correct pathological flexions of the uterus, to dilate a stenosed cervix.

Tangle and Tupelo tents have the same scope as the sponge tent.

Fig. 100.

Expanded tupelo tent with constriction at os internum (Mundé).

These do not, however, expand so well and thoroughly. Their special advantages are due to their smaller size, and the fact that several may be passed into the same cervix. They are specially useful, therefore, in

cases of narrow cervix and flexions Tupelo tents are highly praised by Landau and Mundé, but are still on trial.

3. *Preliminaries to and Method of Use.*—Tents should not be passed during an ordinary menstrual period, although they often require to be used when pathological bleeding is going on. They should always be passed at the patient's own house ; and she should be kept strictly in bed during their use, and for some time after. Before their use, the vagina should be thoroughly washed out with warm carbolic lotion (1–40). Schultze, in passing tangle tents for flexions, first ascertains the uterine curve with the sound ; if blood follows its use, he postpones the introduc-

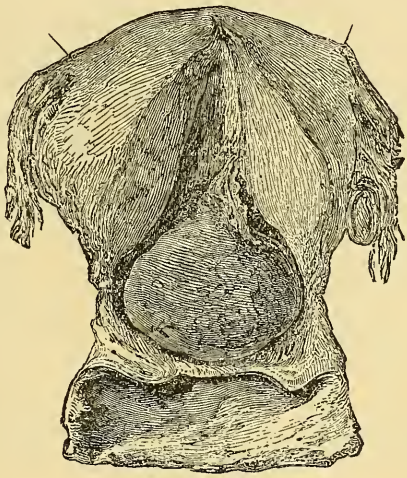

Fig. 101.

Sponge tent polypus of Sir James Simpson ($^1/_1$). The figure shows a drawing of the uterus, which contained a polypus—obtained from a patient of Sir James Simpson's, who died from the hemorrhage it caused. It was this preparation which suggested to him the sponge tent.

tion of the tent for forty-eight hours, in the meantime applying pure carbolic acid to the endometrium. Before using the sponge tent it is advisable to remove most of the grease covering it.

Sponge tents may be passed in various ways.

(1.) The patient is placed in the genu-facial, or better, in the semiprone posture. Sims' speculum is passed, the anterior lip of the cervix laid hold of with a volsella and drawn down. The sponge or tangle tent, held in forceps, can then be passed into the cervix (Fig. 102).

(2.) The tent is fixed on the spike of an appropriate instrument and is then passed just as the uterine sound ; *i.e.*, with the patient placed in the left lateral position, the index and middle fingers carried into the

vagina and placed on the anterior lip of the cervix. The tent, fixed on the spike, is passed along these fingers and its point made to enter the cervix. The handle is then rotated and carried to the perineum.

(3.) The patient is placed on her left side and athwart the bed. Pass the volsella, draw the anterior lip of the cervix down. The volsella is not always needed. Place the tent between the index and middle fingers of the left hand with the thumb at its base, carry these fingers into the vagina

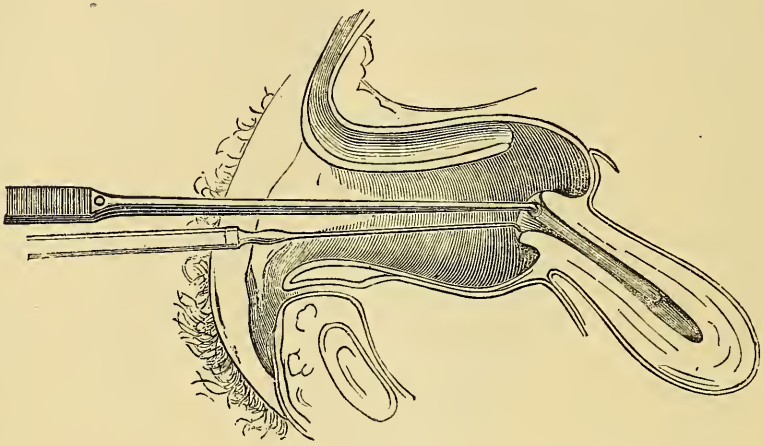

Fig. 102.

Sims' diagram illustrating passage of tangle tent. Patient is semiprone, Sims' speculum passed, and cervix steadied with tenaculum. The tent is passed with forceps.

with their dorsum on the posterior vaginal wall, make the point of the tent enter the cervix and push it on with the thumb.

Another way is to use the volsella as above described, but to fasten it to the bed. Then pass Sims' speculum, holding it with the left hand, so that the tent held in the right hand can be passed into the cervix just as one would thread a darning needle.

Tangle and Tupelo Tents.—The same instructions as for sponge tents hold good. Tangle tents, however, when used to correct flexions must first be moulded as follows: Ascertain the curve of the uterus by bimanual and sound, select a suitable tent and dip it for a few seconds in boiling water, then mould it to uterine curve and pass it as already explained.

Tents require to be left in the cervix for a period varying from 12 to 15 hours, and the vagina should be frequently douched with carbolic lotion

during this time. At the end of this period the tent requires to be removed. During the removal no great force should be used. Sometimes the removal is difficult, owing to constriction by the os internum or irregularities in the mucous membrane.

The cervix is generally now sufficiently dilated to admit of digital examination of the endometrium. If not, another tent should be employed.

4. *Dangers of Sponge and Tangle Tents and Contra-indications.*—The practitioner must keep prominently before him that the use of a tent may prove by no means a harmless measure. Cases of death from septicæmia after the careful and proper use of *one* tent have occurred. The patient runs a risk proportionate to the number used; and, therefore, it is not advisable to use more than two consecutively unless under special circumstances. They are not to be used if acute or subacute pelvic inflammation, ovaritis (acute or chronic), carcinoma cervicis, or pelvic hæmatocele be present.

The reason why sponge tents may prove dangerous is only too apparent. The uterine mucous membrane is a lymphatic surface absorbing

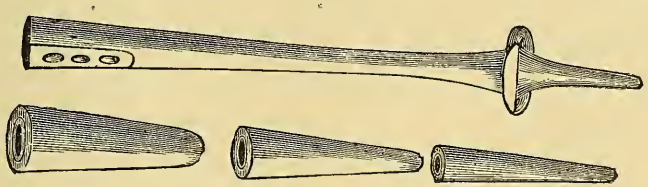

Fig. 103.
Tait's dilators.

most rapidly. We cannot insert sponge tents with Listerian precautions; and in addition we have the expanding pressure of the tent forcing septic matter into the mucous membrane. Thus it is quite evident that the consecutive use of two or more sponge tents is dangerous.

To sum up briefly, tents are highly useful in necessary cases—no means at the disposal of the gynecologist gives him in proper cases such valuable help; but he should not forget the risks occasionally arising from their use—risks which should make him cautious but not timid.

DILATATION BY GRADUATED HARD RUBBER DILATORS—TAIT'S, HANK'S.

Tait's dilators consist of graduated vulcanite cones (Fig. 103) which can be screwed into a suitable handle. The proximal end of the handle is

perforated for elastic bands which, passing in front and behind, are attached to a suitable belt around the patient's waist. Thus the elasticity of the India-rubber causes the cone gradually to pass up into the cervix, dilating it as it goes. By this apparatus, Tait claims to avoid septic infection and to dilate rapidly.

The obvious objection to this apparatus is the amount of watching it entails and the absence of the pelvic curve on the handle.

In cases, chiefly of abortion, where the os is dilatable, Hank's dilators

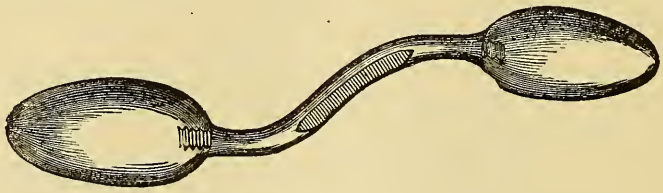

Fig. 104.

Hank's dilator. (1/1)

seem serviceable. They have the oval shape seen at Fig. 104, are graduated in size and screw into the sigmoid handle. They can be used manually to dilate the cervix until the fingers can be passed through.

CHAPTER XIII

THE CURETTE.

LITERATURE.

Mundé—The Dull Wire Curette in Gynecological Practice: Ed. Med. Jour., XXIII., p. 819. *Noeggerath*—Am. J. of Obst., IV., p. 3. *Recamier*—Memoire sur les Productions Fibreuses et les Fongosités Intrauterines: Univ. Med., 1850. *Sims, J. Marion*—Clinical Notes on Uterine Surgery: London. *Simon*—Die Auslöffelung breitbasiger weicher sarkomatöser und carcinomatöser Geschwülste aus Körperhöhlen: Beiträge zur Geburtshülfe von der Gesellschaft in Berlin, 1872. *Thomas*—Op. cit.

The curette is an instrument, provided with a cutting or with a dull edge, which can be introduced into the uterine cavity previously dilated by tents (although this is not always necessary) for the purpose of scraping off or removing abnormal endometric granulations, sarcoma of the mucous membrane, carcinoma of the cervix, or the remains of an incomplete abortion. This instrument has had a somewhat chequered career. Originally introduced by Recamier, whose instrument was stiff and sharp, it did good work in some cases, but fell into disrepute, undoubtedly deserved, after the record of certain instances where its use had caused perforation of the uterus. Marion Sims and Simon recommend a modified instrument which, owing to its stiff unyielding nature, has found little favour with the profession. Thomas then introduced his flexible dull wire curette, which, popularised by Mundé in an able article, has taken its place in the gynecologist's armamentarium as a useful instrument, to whose employment there is attached no more risk than attends most intrauterine manipulations.

Fig. 105.

Loop of Recamier's curette.

There are four varieties of curette—(1.) Recamier's (Fig. 105); (2.) Simon's (Fig. 106); (3.) Thomas' (Fig. 107); (4.) Sims' (Fig. 108).

Thomas' instrument is 9 inches long, and has a handle $3\frac{1}{2}$ inches long. The metal portion ($5\frac{1}{2}''$ long) is made of soft copper wire, $\frac{1}{6}$ inch thick near the handle, and $\frac{1}{12}$ inch thick half an inch from the end, where it forms a loop (Fig. 107) flattened on the scraping edge. Russell Simpson,

Fig. 106.

Simon's spoon. (⅔)

Fig. 107.

Thomas' dull wire curette, with knob added by Russell Simpson. (½)

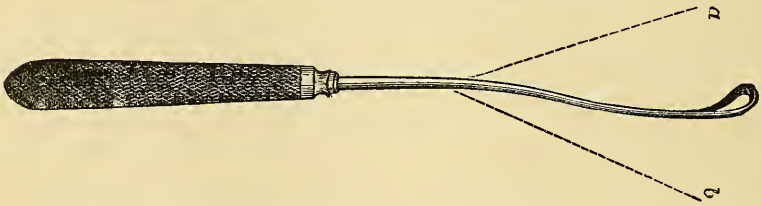

Fig. 108.

Sims' curette, with flexible shank: *a* and *b*, extent of flexibility.

of Edinburgh, has modified it usefully by adding a knob $2\frac{1}{2}$ inches from the point. This enables one to use it with more precision.

Cases in which the Curette is useful.—Recamier's is useful in the same class of cases as Thomas'. Simon's is specially good in carcinomatous cervix, but not in endometric conditions. Thomas' is good in hyperplastic endometritis, sarcoma of the mucous membrane, and, above all, in incomplete abortion.

It is evident, from what has been said, that the curette aids immensely in intra-uterine diagnosis. By it portions of abnormal intra-uterine conditions can be removed and submitted to microscopic investigation.

How to use Thomas' Curette.—Place the patient semiprone, pass Sims' speculum and draw down cervix slightly with volsella. Then pass in the curette, curved if needed (no previous dilatation with tent being required), and gently pass it over the mucous membrane, pressing against

it while the loop is being brought down. Do this systematically over the whole anterior and posterior uterine surface, remembering its shape (Fig. 14, A).

Curetting may be done single-handed when the volsella and Battey's speculum are used, as described at p. 117; or in some cases Fergusson's speculum may be employed, and the cervix then drawn well down with the volsella.

After the curetting is finished, apply pure carbolic acid to the endometrium as given under endometritis.

Cautions and Dangers.—The same precautions should be used as given under sponge tents. The dangers have proved in the authors' hands slight, a minor attack of pelvic peritonitis being the worst.

CHAPTER XIV.

KNIVES; SCISSORS; NEEDLES; SUTURES; ANTISEPTICS; DOUCHES AND SYRINGES; CAUTERY; ANÆSTHETICS.

KNIVES.

For perineal operation, the surgeon's ordinary straight bistoury is sufficient. For vaginal and cervical surgery, long-handled knives with the blade straight or at an angle to the shaft are required (*v.* under operation for vesico-vaginal fistula).

SCISSORS.

These are of the greatest use to the gynecologist and supersede the use of the knife in many instances. Straight, sharp-pointed scissors are valuable in repair of the perineum. Curved scissors are necessary for fistula cases (Fig. 109), Bozeman's being specially good. They are right

Fig. 109.
Simple curved scissors.

and left, but no woodcut gives a proper idea of their curves. For cervical operations, stout and sharp scissors are necessary. It is very important to remember that the vaginal portion of the cervix is exceedingly tough, and that the ordinary scissors in dividing it slip down or even turn obliquely, leaving the tissue uncut. Kuchenmeister's scissors have this tendency obviated by one of the blades being hooked (Fig. 110). Even these scissors sometimes prove unsatisfactory, as the finger-and-thumb grip they give is not powerful enough. Fig. 111 shows a pair of

cervical scissors devised by Hart, where the handles are like those of bone forceps and are provided with a ratchet. They can, therefore, be grasped in the palm of the hand while being used, and cut even the densest cervix

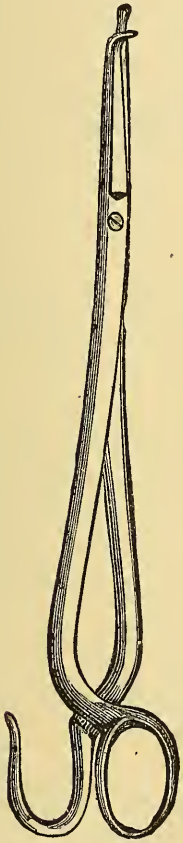

Fig. 110.

Kuchenmeister's scissors.

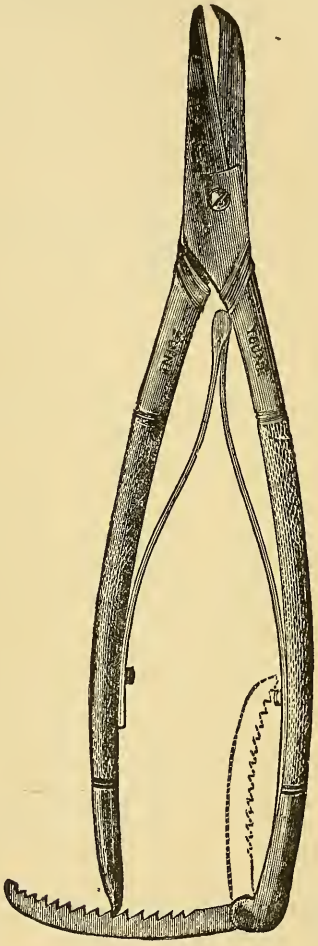

Fig. 111.

Hart's cervical scissors.

with great precision. Scissors are highly useful in perineal, vaginal, and cervical operations.

NEEDLES.

We need only note that for cervical and fistula operations strong and short needles with only a very slight curve (or perfectly straight) are

needed. The cervical tissue is so dense that markedly curved slight needles snap. They are passed with a needle holder, of which Fig. 113

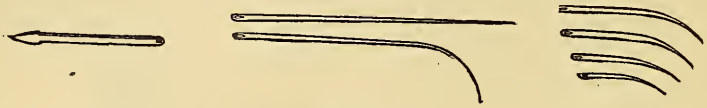

Fig. 112.

Forms of needles (Emmet).

Fig. 113.

Needle-holder.

shows a simple form. Curved or tubular needles set on handles are also useful.

SUTURES.

These may be silver wire, carbolized silk, catgut, silk-worm gut or horse-hair. For fistulæ, deep stitches, and cervical laceration, *silver wire* is best. For perineal operations, for superficial stitching, as also for stitching the ovariotomy incision, *silk-worm gut* is good. *Catgut* is valuable in the rectal stitches of complete rupture of the sphincter ani. *Carbolized silk* (thin and fine) is best for the ovariotomy pedicle. Simon also used silk in his fistulæ cases. *Horse-hair* is useful for superficial skin stitches.

ANTISEPTICS.

This naturally divides itself into two sections: viz., Listerism, as conducted in peritoneal operations; and the modified form of antiseptics carried out in vaginal and cervical surgery. Details on the first of these will be given most conveniently in speaking of ovariotomy. We may remark, however, that at present the question of the propriety of the spray in peritoneal operations is still under discussion. Listerism is directed against the atmospheric surrounding of wounds, and it is not in any sense a direct treatment of wounds. In peritoneal operations there is the peculiarity that the peritoneum is an absorbing sac which readily takes up carbolic acid in the form of the finely divided spray. Many

eminent ovariotomists allege, therefore, that the spray at present considered necessary for Listerism is hurtful in all peritoneal operations; and that it causes, for the reason already given, high temperatures and kidney complications. This has not been absolutely proved, but is worthy of the careful attention of all operators. Even if sustained, it does not invalidate the high claims of Listerism on general surgery.

During perineal, vaginal, and cervical operations the use of the *douche* is invaluable. For this purpose a large douche apparatus filled with carbolic lotion, 1–40, with long indiarubber tube and small narrow nozzle is employed. It is placed somewhat above the level of the part to be operated on, and under the charge of an assistant plays a small jet on the surface. Apart from its valuable antiseptic action, it clears away blood from the cut surfaces, enables the operator to pare the fistular edges very exactly, and altogether is a most valuable help. It can be suitably warmed; and the excess of fluid flows into any receptacle, such as a foot-bath or large tray on which the legs of the table are placed. Instead of carbolic lotion, boracic or thymol lotion can be substituted.

VAGINAL SYRINGES AND DOUCHES.

For the purpose of applying antiseptic and astringent lotions to the vagina and split cervix, for hot-water injections, and for merely cleansing purposes, the vaginal syringe and douche are employed.

Vaginal Syringes.—Fig. 114 shows the well-known Higginson syringe.

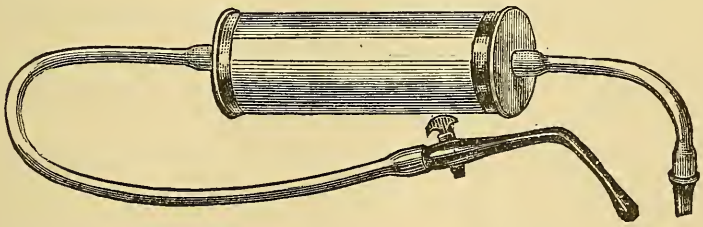

Fig. 114.
Higginson's syringe.

Valuable as this is, it is difficult for ordinary patients to manage single-handed. For them we should therefore recommend the

Vaginal Douche.—A convenient form of this is shown at Fig. 115. It can be hung up after being filled, and by the gravitation thus afforded a gentle flow is obtained. The overflow from the vagina is received into any suitable receptacle on which the patient sits.

For patients in bed its use is equally easy. The nurse or attendant should be instructed to make the patient lie on her back, the hips being well raised with a pillow. The pillow itself should be covered with a

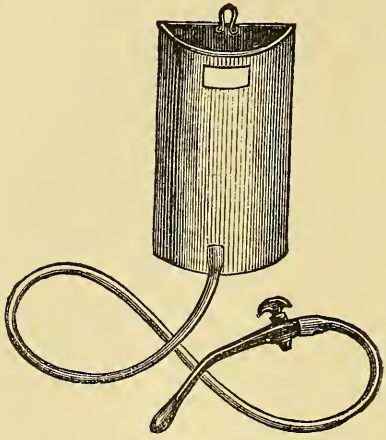

Fig. 115.
Vaginal douche.

waterproof or folded blanket. An ordinary basin is then slipped below the hips to receive the overflow.

According to some, the force of the jet of water given by the Higginson is specially valuable—why is not very evident.

The great advantage of the douche is its simplicity. Half of the women who buy a Higginson do not know how to use it, and find it troublesome even when they do know.

The material for injection is varied. Hot water, as hot as the patient can bear it, is invaluable in inflammatory conditions.

Hot carbolic lotion (equal parts of boiling water and 1-20 lotion) is admirable in abortion cases, for cleansing purposes.

In leucorrhœal conditions; injections of alum (ʒ j. to Oj.), sulphate of copper (ʒ ss. to Oj.), sulphate of zinc (ʒ ss. to Oj.) are good.

The general formula for these is—

℞. Aluminis, vel
Cupri Sulphatis, vel
Zinci Sulphatis..... ʒ j.
Fiat pulv; mitte tales xij.
Sig. To be used as directed.

The patient is told to dissolve one powder, or half of one, in a pint of water, to place this in the douche and use it as already explained.

It is a good plan to make the patient first douche with hot water and then finally, in the dorsal posture, to finish up with the special lotion. After it is finished the dorsal posture should be maintained for ten minutes, and the last of the injection expelled by sitting up.

CAUTERY.

The ordinary cautery may be employed in the treatment of the pedicle in ovariotomy. Details on this are postponed till that is considered.

Fig. 116 shows the well-known Paquelin's cautery. In this very elegant and useful instrument the vapour of benzoline is pumped through a slender,

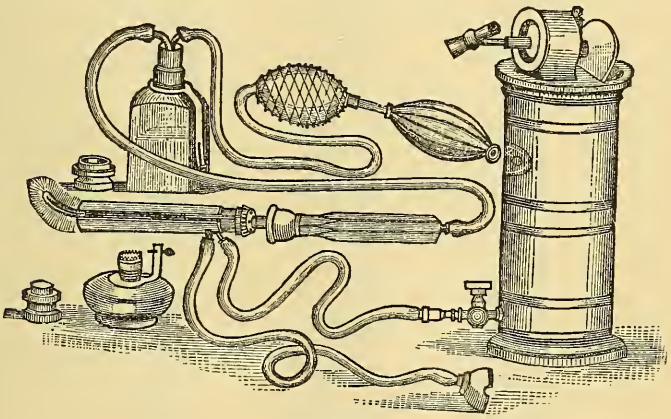

Fig. 116.

Paquelin's cautery and Wilson's antithermic shield. The shield is seen covering the rod. The water apparatus is to the right. A spirit-lamp is also figured (Mundé).

hollow cone of platinum, the latter being previously heated in a gas flame or spirit lamp. It speedily becomes red or white hot by the combustion of the vapour, and can then be used.

Note as to its use—(1) To be careful with the benzoline, as it is exceedingly inflammable ; (2) To heat the platinum cone first (in outermost zone of the flame) before pumping in the benzoline. If the vapour is pumped in before the platinum is hot enough to ignite it, the cone is cooled by its cold stream.

The cautery should be used at a dull heat. When white hot it causes bleeding, because it thoroughly burns the tissues and thus leaves no char to act as a hæmostatic.

When used to cauterize the cervix, care should be taken that the hot metal rod does not touch the vaginal walls. It requires considerable care to avoid this. Various plans have been tried. Thus the rod may be covered except at its terminal two inches with a wooden case which must not touch the metal. More recently Dr. Wilson of Baltimore has devised an

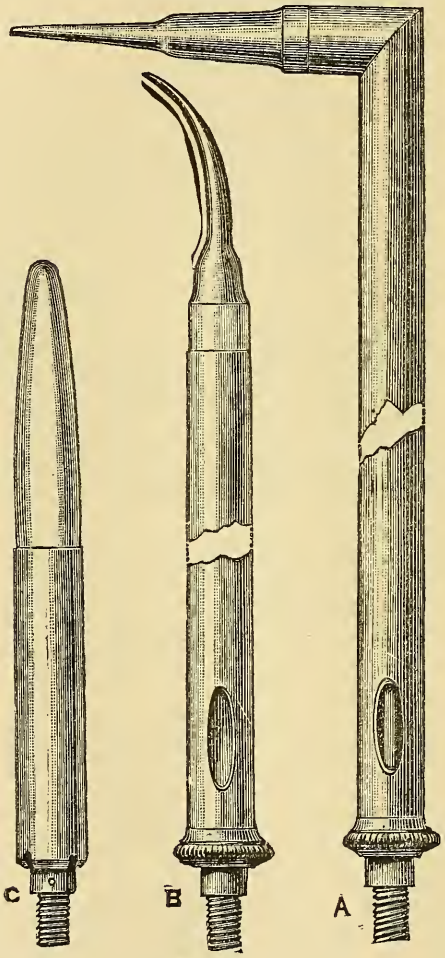

Fig. 117.

Various forms of Paquelin's cones, *A*, rectangular; *B*, curved; *C*, straight.

antithermic shield through which a stream of cold water is sent by an appropriate apparatus (Fig. 116). Fig. 117 shows some of the various rods of Paquelin's cautery; and Fig. 116 the same covered with Wilson's antithermic shield.

ANÆSTHETICS.

LITERATURE.—*Brunton, T. L.*—Remarks on One of the Causes of Death during the Extraction of Teeth under Chloroform, Br. Med. J., II., 1875, p. 395. *Chiene*—Chloroform, London Practitioner, January, 1877. *Hart, D. B.*—On Death from Insufficient Administration of Chloroform, Ed. Med. J., 1879. *Lister*—Chloroform in Holmes' System of Surgery, Vol. V.: Report of Br. Med. Asso. Committee, Br. Med. J., Vol. I., 1879.

The chief anæsthetics are chloroform and ether. Other agents or mixtures have been tried, viz., ethidene; mixtures of alcohol, ether, and chloroform; nitrous oxide; bichloride of methylene: the results have not been satisfactory with these. In the British Medical Report on the action of anæsthetics, ethidene is strongly recommended. Chloroform and ether, however, still remain our most trustworthy agents.

Action of Chloroform.—Chloroform when administered to a patient has a perfectly definite effect on the nervous system. Sensation is first abolished, and then reflex action. This is all the effect wished for in any case. If, however, the chloroform be pushed farther, the respiratory centre becomes paralyzed, so that breathing ceases, and finally the heart stops from paralysis of its ganglia. In almost all cases this is the *sequence in the susceptibility* to chloroform of those parts of the nervous system regulating sensation, reflex action, respiration, and the circulation. Rarely have we the heart affected before the respiratory centre. When first administered it causes a transient rise in the blood-pressure, and then a gradual irregular fall. The more recent investigators on this point (see the British Medical Report) found that in dogs chloroform reduced the blood-pressure more rapidly and to a greater extent than ethidene, and that ether did not cause any appreciable depression. As the blood-pressure is the resultant of the force and frequency of the heart's action and the state of dilatation of the small blood-vessels, it is evident that chloroform when administered to dogs slowed the heart and weakened the vasomotor centre more than ethidene or ether. It should be kept in mind, however, that dogs are very susceptible to the action of chloroform and easily killed by it.

It is wrong to suppose that in every chloroform death the fatal result is caused by an overdose of chloroform, or by the action of the chloroform on a fatty heart. This is a very common view, but an exceedingly erroneous one.

The one great object of anæthesia is to prevent the patient's feeling pain. This is one of its most gratifying results, but it is not by any means *the* great object in operative cases. One of the most essential aims of its administration is to prevent the reflex transmission of powerful nervous impulses from the part operated on to the heart, or their direct transmission to the respiratory or vasomotor centres. If chloroform be administered to a limited extent so that sensation alone is abolished, and if any large nervous trunk like the Fifth, or large nervous area like the Splanchnic, be irritated, then we may have reflex inhibition of the heart, or paralysis of the vasomotor and respiratory centres; in man, death may result. There are good clinical reports that this reflex inhibition of the heart has caused its stoppage in man. It is sometimes urged against this that no amount of stimulation of the lower end of the cut vagus in a rabbit can permanently stop its heart; in man, however, the conditions are not the same as in the rabbit. Goltz, quoted by Lauder Brunton, gives some most interesting facts in this connection. A frog was decapitated, its heart exposed, and the animal hung with its legs downwards. On tapping the intestines pretty hard, the heart stopped through reflex inhibition of the vagus but soon resumed again. It contracted vigorously but had no blood in it to propel. The irritation of the splanchnics had not only inhibited the heart but so lowered the tone of the vasomotor centre that the veins of the abdominal cavity were widely dilated; and thus the blood, when the animal was vertical, did not reach the opening of the inferior vena cava into the right auricle. When the frog was laid on its back, however, the blood flowed at once to the heart.

This then gives us the proper view of the administration of chloroform in all cases where cutting operations or operations involving large nervous trunks are being performed.

The chloroform must be pushed until sensation and reflex action are abolished, and this state is to be kept up during the operation.

Uses.—Chloroform is used in all cutting operations except in very slight ones; in cases where the straining of the patient prevents the manipulation necessary for accurate diagnosis and treatment; in cases of phantom tumors; and also, when necessary, in cases where vaginal examination of virgins is requisite.

In division of the cervix, curetting of the endometrium, and application of caustics to the endometrium, it is unnecessary unless the patient is unusually sensitive.

Method of Administration.—The patient should have no food for three or four hours prior to the operation. Just before the administration of chloroform is begun, half a glass of wine or brandy may be given.

The patient should lie on her back with all fastenings unloosed, and should not sit up. A towel or napkin folded square is taken and chloroform poured on it. Fig. 118 shows a convenient and economic drop cork which can be fitted into any bottle. The amount does not matter. We judge of the state of the patient not by the amount poured on the cloth but by the effect on the patient. If reflex action be not abolished,

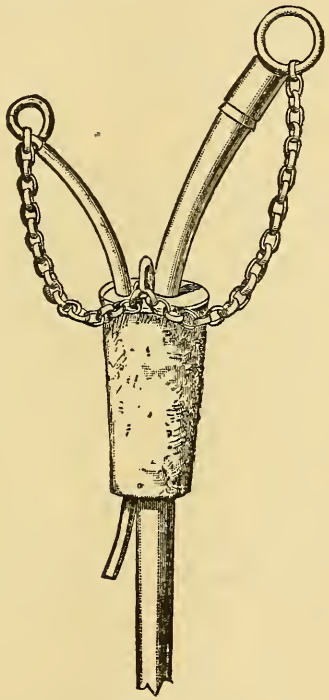

Fig. 118.
Chloroform drop cork.

even though a quart has been used, the patient has not had enough; while, if respiration be affected after a few whiffs, she has had too much.

The face of the patient should look to the side and the chin should be kept well away from the sternum. The administrator should keep the chin forward with his right hand. This is, in addition, valuable, as he can always feel the puff of the breath on the palm.

The cloth is to be held not too closely over the face, and the patient directed to take long breaths.

The administrator has to keep two points before him. He is to watch the breathing most narrowly, and to a scertain when reflex action is abolished.

He can watch the breathing well by feeling the puff of the breath constantly on his hand. The abolition of reflex action is generally tested by touching the conjunctiva; when the patient is not fully under, the orbicularis contracts. This is not a perfect test, but the best we have.

When reflex action is abolished, no more chloroform is to be given; should it show signs of returning, fresh chloroform is put on the cloth.

DANGERS.

These may be the following:—

(1.) *Asphyxia,*

(2.) *Reflex inhibition of Heart or Respiratory or Vasomotor Centres.*

(1.) *Asphyxia.*—This may arise early from fainting, muscular relaxation allowing the tongue to fall back on the pharynx; or from closure of the glottis, owing to paralysis of its intrinsic muscles. The marked extension of the head already insisted on prevents the former from happening. If it arise, the tongue is to be pulled well forward with a pair of forceps. Foulis recommends that the tongue be pressed forward by a spatula or spoon applied at its root.

When asphyxia arises from paralysis of the respiratory centre, owing to an overdose of chloroform, the treatment is immediate stoppage of the administration of the chloroform *and artificial respiration by Sylvester's or Howard's method for hours if necessary.* The head should be kept hanging over the edge of the table, so as to send blood to the respiratory centre; or the patient may be inverted (Nelatonized).

(2.) *Reflex inhibition of the Heart or Respiratory or Vasomotor Centres.*—This can only happen when there has not been given sufficient chloroform to abolish reflex action. It is by no means an uncommon thing, therefore, for the patient to die because sufficient chloroform has not been administered; sensation alone has been abolished when the operation is begun. The usual account is that "the patient gave a start when the first incision was made, and died." In some cases this has happened after only a teaspoonful had been poured on the cloth. Yet this is often called "a death from chloroform."

Contra-indications.—Every patient on whom an operation is to be per-

formed may have chloroform ; if the operation is indicated, so is chloroform. If the patient has a weak heart, then chloroform is imperative for any operation ; it must be given till reflex action is abolished, as any reflex inhibition of the heart is specially dangerous here.

Occasionally, chloroform causes severe vomiting after the operation. For this reason Keith always uses ether instead. Vomiting during the operation is dangerous only when any solid vomit regurgitates back into the trachea ; tracheotomy may then be necessary.

Sickness after the operation is treated by the sucking of ice and the application of a mustard leaf to the pit of the stomach.

PART II.

DISEASES OF THE FEMALE PELVIC ORGANS.

We classify the diseases of the female pelvic organs according to the structure which is affected, and devote one section to each group of affections as follows:

Section III. The Peritoneum and Connective Tissue;
" IV. The Fallopian Tubes and Ovaries;
" V. The Uterus;
" VI. The Vagina;
" VII. The Vulva and the Pelvic Floor.

Further, we shall consider under special sections disturbances of the following functions:

Section VIII. The Menstrual Function;
" IX. The Reproductive Function.

Finally, we shall devote one section to affections of the neighboring organs:

Section X. The Bladder and the Rectum.

Syphilis and Chlorosis, as they are constitutional conditions, will be considered in the Appendix, in which also a chapter will be given to Case-taking and to Gynecological Literature.

SECTION III.

AFFECTIONS OF PERITONEUM AND CONNECTIVE TISSUE.

CHAPTER XV. Pelvic Peritonitis and Pelvic Cellulitis.
" XVI. Pelvic Hæmatocele.

CHAPTER XV.

PELVIC PERITONITIS AND PELVIC CELLULITIS.

LITERATURE.

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In considering the subjects of pelvic peritonitis and pelvic cellulitis it will be convenient to take up some preliminary matter and then to consider separately each condition under the following heads :

Nature.

Pathological anatomy and varieties.

Etiology.

Symptoms.
Physical signs.
Diagnosis : Differential diagnosis.
Course and results.
Prognosis.
Treatment.

Preliminary Considerations.—The subjects of pelvic peritonitis and pelvic cellulitis are by no means thoroughly worked out. The literature is extensive, but not so valuable as medical literature often is. This arises from various causes, among which the most important is the change in the theories as to the anatomical site of pelvic inflammatory conditions. Nonat and Simpson contended that pelvic peritonitis and pelvic cellulitis were distinct affections, and considered the latter as being of frequent occurrence. Then Bernutz and Goupil turned the tide for some time by their able work, where they classed almost all pelvic inflammatory affections as peritonitic. They, however, greatly underrated the amount of connective tissue surrounding the cervix, just as Guerin has more recently written in the same strain as to the connective tissue of the broad ligaments; and Le Bec, too, has endeavored to support the opinions of the latter by his observations on the lymphatic distribution of the broad ligament.

There is now little doubt that Bernutz and Goupil pushed their views too far; so that in America, Germany, and Britain, gynecologists now consider pelvic inflammation as either peritonitic or cellulitic. Clinical, anatomical and pathological facts are each day putting this view on a firmer basis. The fact, however, that these diseases are not rapidly fatal, and that generally we get *post-mortems* only of advanced or resolved cases, along with the admitted difficulty of exact clinical differentiation, renders our knowledge at present much less complete and exact than could be wished.

Finally, we must note that both diseases are always combined. Thus in a marked pelvic peritonitis there is always some pelvic cellulitis, and in a marked pelvic cellulitis always some pelvic peritonitis. This is quite analogous to what is found in pleurisy and pneumonia.

PELVIC PERITONITIS.

Synonyms.—Perimetritis; Pelveo-peritonitis.

Nature.—An acute or chronic inflammatory condition affecting chiefly the pelvic peritoneum.

PATHOLOGICAL ANATOMY AND VARIETIES.

In the early stages, the peritoneum is injected and the epithelial cells dull in lustre. Soon, in marked cases, fibrinous or serous fluid is poured out: the former stiffens the peritoneum and often causes extensive adhesions between uterus and rectum, Fallopian tubes and ovary; the latter either remains free in the cavity, or becomes encysted by the false membranes already alluded to, often making Douglas' pouch to bulge down. In bad cases, pus is the secretion. We may therefore speak of simple pelvic peritonitis, adhesive pelvic peritonitis, and serous or purulent pelvic peritonitis. These, however, are mere varieties.

ETIOLOGY.

The causes of pelvic peritonitis are numerous. They are chiefly the following:—

1. The previous existence of a pelvic cellulitis; pelvic hæmatocele; ovaritis; ovarian tumor; fibroid tumor; tubercle, and carcinoma.
2. Childbirth and abortion.
3. Gonorrhœa.
4. Latent gonorrhœa in the Male.
5. Menstruation.
6. Venereal excess.
7. Instrumental examination by the sound: stem pessaries; sponge tents; tangle tents.

1. *The previous existence of a pelvic cellulitis; ovaritis; ovarian tumor; fibroid tumor; tubercle, and carcinoma.*

We have already noted that marked pelvic cellulitis is always associated with some pelvic peritonitis. The pelvic peritoneum and cellular tissue are adjacent and intimately connected with one another in their vascular, nervous, and especially in their lymphatic supply. We have already seen how the stomata of the peritoneum communicate with subendothelial lymphatics. In the same way we can understand a pelvic peritonitis arising secondarily from ovaritis.

Ovarian tumors often set up pelvic peritonitis after being tapped, as well as from their mere mechanical pressure—a fact of the highest importance as regards the operation of ovariotomy. Small fibroids, tubercle and cancer do the same, and thus give rise to considerable difficulty in

diagnosis. Dr. Foulis, of Edinburgh, has thrown much light on malignant peritonitis, by showing that in the ascitic fluid we find very characteristic cell clusters. This will again be referred to under ovarian tumor.

2. *Childbirth and Abortion.*—When an inflammatory lesion follows these, it is generally cellulitic and, as we shall afterwards see, septic. Pelvic peritonitis often enough follows, and is then probably likewise septic. According to Lusk, who quotes Steurer's as yet unpublished researches, "bacteria pass along the lymphatics . . . and perforating those beneath the peritoneum set up pyæmic peritonitis." At the same time, the peritonitis may result from simple bruising.

3. *Gonorrhœa* is one great cause of peritonitis. It may result from actual spread of the gonorrhœal virus ; or be sympathetic, like orchitis in the male. In the former case the purulent infection probably passes along the Fallopian tubes and out at the fimbriated end, setting up a severe peritonitis. In puerperal women, gonorrhœa is by no means innocent therefore, as the following case by Russell Simpson shows :—

"J. C., primipara, prostitute, æt. 18, admitted to the hospital and was delivered of a male child. On the afternoon following severe peritonitis set in, which proved fatal in ten days. On *post-mortem* the abdomen contained ℥ viii. of yellow pus. Surface of intestines covered with recent fibrinous lymph becoming purulent. Mucous membrane of bladder much congested and in certain areas rough and granular. . . . On squeezing the Fallopian tubes a large quantity of pus was expelled and the tubes appeared to be much distended with it. Mucous membrane much congested" (Report by Dr. D. J. Hamilton).

4. *Latent Gonorrhœa in the Male.*—By this term Noeggerath of New York, who first directed attention to the subject, means a gonorrhœa in the male apparently cured, which some time after—even two years—infects a virgin vagina, causing discharge and pelvic peritonitic disturbance. This subject comes up under Gonorrhœa. The authors have seen some cases bearing out Noeggerath's views.

5. *Menstruation.*—It can be readily understood how the pelvic congestion of menstruation may in certain cases cause peritonitis. There may be some blood effused which sets it up.

6. *Venereal excess* in prostitutes and newly married women may, for evident reasons, have peritonitis as its sequel.

7. *Instrumental Manipulation.*—This is alluded to under the various instruments and needs mere mention here.

We append Bernutz's analysis of the causes of pelvic peritonitis in ninety-nine cases.

43 occurred in puerperæ.
28 " after gonorrhœa.
20 " during menstruation.

8 traumatic:
- 3 due to venereal excess.
- 2 " syphilitic diseases of cervix.
- 2 " introduction of the uterine sound.
- 1 " use of vaginal douche.

SYMPTOMS AND PHYSICAL SIGNS.

A. Acute Peritonitis.

Symptoms.—Increased, full, and bounding pulse; increased temperature; rigor; shooting pains very severe.

Physical Signs.—On palpation of lower part of abdomen the patient complains of pain; and the abdominal muscles, apart from the patient's volition, resist pressure. She lies usually on her back, and with both legs drawn up.

On vaginal examination the vagina feels hot and tender, and pulsating vessels may be felt in the fornices.

After exudation is present we may feel one or other of the following conditions.

1. A flat, hard, non-bulging condition of the fornices round the cervix, which is not displaced to one or other side but is immobile. The usual simile, and a very good one, is that it feels as if plaster-of-Paris had been poured into the pelvis.

2. An indistinct fulness high up in the pelvis. This is from free serous exudation.

3. A bulging tumour behind the uterus displacing it to the front; or a tense fluid laterally, apparently in the site of the broad ligament (Fig. 45). The former is due to encysted serous effusion in the pouch of Douglas, the latter to encysted serous fluid behind the broad ligament displacing it forwards. As a general rule these effusions are high in the pelvis and symmetrical. Sometimes the bulging retro-uterine tumour feels nodulated after a time; this is from extension of the inflammatory condition into the subjacent connective tissue.

Note that the bimanual is often impossible owing to the rigid condition

of the fornices and abdominal muscles. The bimanual estimation of effusion is often wrong, owing to the fact that we feel the rigid peritoneal membrane through the fornices, and from the rigidity of the abdominal wall draw the conclusion that there is effusion between these. Careful examination under chloroform is of the highest value in such instances.

B. Chronic Peritonitis.

Symptoms.—These are chiefly backache, sideache, leucorrhœa, increased menstruation and sterility. Pain is the most marked symptom, and is felt most on vaginal examination or coitus.

Physical Signs.—On vaginal examination obscure thickening is felt in the fornices. The uterus, if displaced, is often markedly anteverted from cicatrization of the peritoneum in the pouch of Douglas. Very frequently it is retroverted and bound down by adhesions, which may, however, allow of a certain range of mobility. The chronic form remains often as a sequel to the acute ; but may develop slowly of itself.

DIFFERENTIAL DIAGNOSIS.

This will be considered under Cellulitis.

COURSE AND RESULTS.

Very often the inflammatory condition clears up. The adhesive form leaves its mark in the shape of pathological anteversions, and retroversions bound down (Fig. 119). The Fallopian tubes may have their ovum-conducting power so interfered with that an incurable sterility results. When they are not injured to this extent, conception may occur; and the adhesions may ultimately yield to the stretching brought to bear on them by the developing uterus. They may, however, resist this and cause abortion.

Occasionally, pelvic peritonitis becomes general and is then rapidly fatal.

Serous exudations may become absorbed; pus may dry up, but oftener perforates into the bladder, bowel, or roof of vagina.

PROGNOSIS.

Each case must be judged on its own merits. We give, therefore, only general hints.

As to Life.—Pelvic peritonitis is not usually fatal. If it becomes general and is septic or gonorrhœal in its origin, then the prognosis is very grave. A high and rapid pulse of long continuance, with a temperature not in the same ratio, also makes prognosis grave.

As to Sterility.—This is difficult to give, and often time alone settles the point. The mechanical closure by pressure of the Fallopian tube—a condition not diagnosable—and ovaritis rendering ovulation impossible, are conditions often produced and are both incurable. Prognosis as to conception should always be cautious, and never absolute when the peritonitis has been extensive.

TREATMENT.

A. Acute Pelvic Peritonitis.—*a. Prophylactic.*

b. General.—(1.) Diet. (2.) Septicity. (3.) Pain. (4.) Pulse and Temperature.

c. Local.

a. Prophylactic.—This is of the very highest importance. The practitioner should always attend most scrupulously to antiseptic cleanliness in all vaginal, cervical, and uterine operations. Cautions on these points are given under the head of the respective operations, and need not be here repeated.

During their menstrual periods young patients should avoid all undue fatigue, late hours, violent exercise, alternate exposure to heat and cold when insufficiently clad.

Gonorrhœa should be thoroughly treated, especially during pregnancy.

b. General.—Under this we attend to diet, and employ remedies intended to combat the septic condition when present, to alleviate pain, and to bring down pulse and temperature.

(1.) *Diet.*—In the early stages of inflammation, this should be chiefly milk iced or mixed with lime water, potash water or lemonade. Among the better classes Apollinaris or Seltzer water can be used. Seltzer water helps to combat the constipating tendency of milk diet.

When the patient's strength is reduced and the pulse flagging, nutritious stimulating food must be frequently given. Milk should be still continued; but beef-tea or strong soups, every two or three hours, must be added. Stimulants are requisite at this stage, viz., brandy, cham-

pagne, gin, or whiskey. Care must be taken to give these in their stimulating doses, *e.g.*, for brandy, a tablespoonful every two or three hours.

The regulation of the bowels is not requisite in the early stages; but in the later periods must be looked after. Gentle aperients, such as compound liquorice powder, colocynth and hyoscyamus pills, castor-oil, etc., can be used; and occasional enemata are of service. Enemata should not, however, be used exclusively, as this may lead to the formation of troublesome scybala.

When suppuration is tedious, it should be seen that no bed-sores form; and iron and quinine should be administered.

℞. Ferri et Quiniæ Citratis..... gr. lxxx.
Aquæ..... ℥ ij.
Sig. Teaspoonful thrice daily.

or

℞. Ferri et Ammoniæ Citratis..... gr. lxxx.
Aquæ..... ℥ ij.
Sig. Teaspoonful thrice daily.

The bitterness is best masked by dilution with water and not with orange or other syrups, which derange the stomach.

(2.) *To Combat any Septic Condition.*—We know no specific medicine for this purpose. A favorite one is the muriate of iron of the Edinburgh Pharmacopœia.

℞. Tincture Ferri Muriatis (Ed. Phar.)..... ℥ ij.
Sig. Thirty drops thrice daily in a glass of water. Water should be drunk freely after the dose is given, and the mouth thoroughly rinsed.

Quinine may be used for the same purpose.

℞. Quiniæ Sulphatis..... gr. xxiv.
Acidi Sulphurici diluti..... ʒ ij.
Aquam.....ad ℥ vj.
Sig. Tablespoonful thrice daily in water.

(3.) *To alleviate Pain.*—Nothing is so good for this as the hypodermic injection of morphia deep into the deltoid.

℞. Morphiæ Bimeconatis..... gr. viij.
Spiritus Vini rectificati..... ♏iij.
Aquæ..... ℥j.
Sig. For Hypodermic injection. Fifteen minims contain ¼ grain of Morphia.

The bimeconate is a good preparation and causes less sickness than other forms; as one drachm of this preparation contains one grain of morphia and as the hypodermic syringe holds only 30 min., it is impossible to give an overdose to an adult.

When doses larger than a grain are needed, the hypodermic solution of the acetate of morphia (B. P.) may be employed. Twelve minims contain 1 grain, and therefore 3 minims is the first dose for an adult.

It is a good plan for the practitioner to keep the ordinary 8 gr. to ℥j. solution, and to prescribe the stronger solution only for any patient requiring it; in this way he avoids carrying two solutions of different strength, by which mistakes might arise. The *stronger* solution is prescribed as follows:—

℞. Injectionis Morphiæ Hypodermicæ (B. P.)..... ʒij.
Sig. For Hypodermic injection. Three minims contains ¼ grain Acetate of Morphia.

Chlorodyne (25 min.); Battley's solution (liquor morphiæ sedativus, 25 min.); or Laudanum (tinctura opii, 25 min.) may be used. More useful than these are morphiæ suppositories.

℞. Morphiæ Hydrochloratis..... gr. ⅓
Fiat Suppositor..... Mitte tales vj.
Sig. As directed.

It is a good plan to quiet the pain rapidly with the hypodermic injection; and to keep up the good effect by suppository, in ⅓ grain doses every 6 hours, beginning 6 to 8 hours afterwards. See that the patient or attendant understands that the suppositories are to be passed into the empty bowel.

(4.) *To bring down Pulse and Temperature.*—In early stages tincture of aconite is invaluable.

℞. Tincturæ Aconiti..... ʒ ij.
Sig. Six drops are to be put in a wine-glass containing six teaspoonfuls of water. Give a teaspoonful every quarter of an hour.

Drop doses of aconite are of great value. They should be given every quarter of an hour until the pulse is reduced and sweating brought on.

If this fail and the temperature keep high, quinine in 15-grain doses should be tried. The salicylate of quinine is a good preparation and is given just as quinine is. When the stomach is irritable the quinine, in 20-grain doses, suspended in an ounce of mucilage, may be given per rectum.

Sometimes the ice-cap is useful.

After the fever has subsided and suppuration is threatened, the strength must be kept up by tonics (such as quinine and iron) and by nutritious food with a judicious amount of stimulant, claret for example.

c. Local Treatment.—In the early stages of sthenic nonseptic cases, 8 to 10 leeches may be applied over the iliac regions.

Ice is not generally used as a local application in this country, and has its disadvantages.

Of greater use are large hot linseed poultices. They should be made very hot, a layer of flannel intervening between them and the skin, and should be covered with a layer or two of cotton. Such a poultice will be effective for 2 or 3 hours. Blisters and turpentine stupes are good, but soon render the skin so sore that after-treatment by poultices is difficult.

The hot vaginal douche (as directed at page 145), with carbolic acid added in septic cases, should on no account be omitted.

Encysted serous collections should, as a general rule, be left to be absorbed. When troublesome from pressure, they may be tapped by Matthieu's aspirator. A clear serous fluid, often coagulable, is then drawn off, so like urine that the almost involuntary first thought is that the operator has tapped the bladder by mistake.

Pus does not form so often in pelvic peritonitis. It may perforate into the rectum or through the posterior fornix. The treatment of suppuration will be best considered under pelvic cellulitis.

B. Treatment of Chronic Pelvic Peritonitis.—When adhesions are extensive, the case is better left alone. When the uterus is retroverted, it may ultimately be replaced by bimanual manipulation. Massage is good in

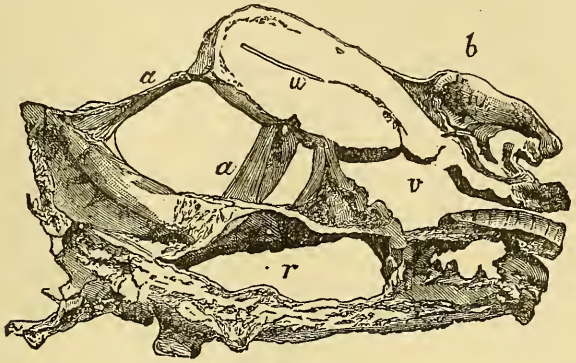

Fig. 119.

Uterus retroverted and bound back by peritonitic adhesions (Winckel). *a a*, adhesions; *b*, bladder: *v*, vagina; *u*, uterus; *r*, rectum (½).

such cases, but its employment will be considered afterwards when we speak of Weir Mitchell's method of treatment by rest and food.

PELVIC CELLULITIS.

Synonym.—Parametritis; *Parametritis proper* is a term applied sometimes to inflammation limited to the cellular tissue round the cervix and upper part of vagina, Virchow's parametric tissue.

Nature.—An acute or chronic inflammatory affection, usually septic, affecting the cellular tissue of the pelvis.

PATHOLOGICAL ANATOMY AND VARIETIES.

It is the rare exception to examine a female pelvis without finding some traces of a previous cellulitis or peritonitis. Thus split cervix, so common in women who have borne children, is almost always associated with some cellulitis at the base of the broad ligaments. The uterus is rarely central, but is often drawn to the one side by the cicatrization of some previous lateral cellulitic inflammation of the broad ligament; the traction may even be so great that it lies at right angles to its proper axis.

We have seen that the utero-sacral ligaments are peritoneal folds containing connective tissue and unstriped muscular fibre. Inflamma-

tory attacks in one or both of these folds (combined pelvic peritonitis and pelvic cellulitis) are very common. Schultze calls this 'parametritis posterior.' The cicatrization of these ligaments after such inflammation, causing traction just above the isthmus, brings about the most common cause of dysmenorrhœa and sterility—pathological anteflexion of the uterus (*v.* Anteflexion of the Uterus). It is evident that in this way, too, we get the uterus anteflexed and drawn to one side or anteflexed and drawn back (Fig. 40).

Sometimes, pelvic abscesses are found in localities to be afterwards alluded to. Often the uterus and ovaries are in an atrophic condition owing to compression of the vessels and nerves by the cellulitic attack; this quite agrees with the clinical fact that many women with bad pathological anteflexion do not suffer much at their periods, because the withered condition of the organs produces scanty menstruation. Freund has written on a peculiar condition under the term "Parametritis chronica atrophicans"; he asserts that we have a chronic inflammatory condition, ultimately causing atrophy by compression of blood-vessels: perhaps this may be a final stage of cellulitis. According to some, we can have no cellulitis in the broad ligaments and no formation of pus—abscess of the broad ligaments. Clinical, anatomical, and pathological evidence is in favor of the occurrence of both. At the same time, it is almost impossible clinically to distinguish abscess of the broad ligament from an encysted serous pelvic peritonitis behind it, pushing it forwards.

ETIOLOGY.

In *parous women* the great cause of pelvic cellulitis is septic matter absorbed by the lymphatics from the torn perineum, vagina, or cervix. This passes along the abundant lymphatics in the cellular tissue beneath and in the broad ligaments, causing inflammation of the glands and proliferation of the connective tissue in which these are embedded. Thus we find childbirth, premature labor, and abortion often followed by cellulitic attacks, for obvious reasons. In parturition we have the cervix, for instance, torn vertically at one side; and septic matter deposited there often speedily spreads along the lymphatic stream. Steurer, who investigated an epidemic of puerperal fever at Strasburg, found such cases with diphtheritic patches about the vulva; and from these traced bacteria into the connective tissue spaces where their presence

gave rise to cellulitis; from the spaces they entered the lymphatics causing lymphangitis.

Klebs, who terms the bacteria found in a wound "microsporon septicum," traced their penetration, with or without the aid of wandering white-blood corpuscles, from serous membranes into the connective tissue, and noted their penetration through the eroded wall of a vein.

Recklinghausen found the lymphatics of the skin, at the edge of an erysipelatous patch, filled with bacteria.

Still more recently, Koch has investigated the relation of bacteria and micrococci to traumatic infective diseases in his recent monograph translated by Watson Cheyne. It is well worth perusal.

The practical result of all this is that, in gynecological operations and abortions, all wounds must be kept strictly clean; and that Listerism, when possible, should be carried out (*v.* Ovariotomy and Treatment of Pelvic Abscess). The student will, as he proceeds, see endless applications of these results.

In *nulliparæ*, cellulitis may arise from the same causes as are given under pelvic peritonitis, *e.g.*, exposure to cold during menstruation.

Pelvic peritonitis, in a minor degree, is always associated with cellulitis for reasons already given. So far as we have considered the etiology of pelvic inflammatory affections, we have associated them with some virus, most frequently septic. We do not believe that mere traumatic injury, apart from septicity and tension, can cause any inflammatory attack.

SYMPTOMS.

The patient has a rigor or chill. Pain is felt over the lower part of the abdomen, but it is not so intense as in peritonitis. The pulse and temperature are raised. Often after exudation has taken place, the patient has one thigh alone drawn up.

PHYSICAL SIGNS.

There is pain on palpation of the abdomen; and after exudation has taken place, we feel a fulness at one side of the uterus or in the iliac fossa.

Bimanual examination, always difficult, reveals at first nothing but increased heat and tenderness. After exudation has occurred, it is found in the following positions:

(1.) As a bulging at the side of the uterus, depressing the lateral fornix and pushing the uterus usually to the other side;

(2.) In the upper portion of the broad ligament, and therefore not bulging downwards;

(3.) In the iliac fossa;

(4.) Very rarely, behind the uterus;

(5.) Almost never, between uterus and bladder.

We have seen pus pointing in the inguinal region on one side, and with no dipping down into the pelvis or intermediate connection with the side of the uterus. When pus is present in large amount, the fluctuation can be felt bimanually. When it forms in the centre of a large inflammatory exudation, an obscure boggy feeling may or may not be made out. Aspiration helps here very much.

The course of these exudations, inflammatory or purulent, is explained in two ways.

(*a.*) By the course of the lymphatics, which run, as we have seen, from the uterus outwards, beneath and between the layers of the broad ligament to the glands in the lumbar region.

(*b.*) By the lines of cleavage in the cellular tissue of the pelvis. The student should refer back to König's researches (page 48). Based on these, and on clinical work, König asserts that—

(1.) An exudation in the broad ligament, near the tube and ovary, passes first along the psoas and iliacus and then sinks into the true pelvis:

(2.) Exudations which begin primarily in the deeper cellular tissue on the antero-lateral aspect of the cervix, pass first on to the cellular tissue of the true pelvis at the side of the uterus and bladder; and then pass with the round ligament to Poupart's ligament beneath the inguinal canal; thence they pass outwards and backwards into the iliac fossa:

(3.) Abscesses, developing from the posterior aspect of the broad ligaments, fill first the postero-lateral part of the pelvis and then pass as in (1).

DIFFERENCES AND DIFFERENTIAL DIAGNOSIS BETWEEN PELVIC PERITONITIS AND CELLULITIS.

Differences.

Pelvic Peritonitis.	*Pelvic Cellulitis.*
(1.) Inflammatory affection of pelvic peritoneum chiefly.	(1.) Inflammatory affection of pelvic cellular tissue chiefly.

(2.) Usually general, round the uterus.	(2.) Usually lateral.
(3.) Not always septic.	(3.) Usually septic.

Differential Diagnosis.

(1.) Pain very severe.	(1.) Pain not so severe.
(2.) Patient's legs drawn up on both sides.	(2.) Usually, only one leg drawn up.
(3.) Firm flat effusion not bulging into fornices, and round the uterus. Symmetrical bulging of serous effusion behind uterus. Cervix (vaginal portion) is normal length.	(3.) Firm effusion, bulging usually into fornix of one side. Thus cervix (vaginal portion) apparently shortened on one side.
(4.) Does not spread along round ligament or into iliac fossa, but may affect all peritoneum.	(4.) Exudation or pus spreads in definite directions, and is usually localised.
(5.) Uterus displaced to front, or unaltered in position	(5.) Uterus usually displaced to one side.
(6.) Vomiting more frequent.	(6.) Vomiting less frequent.

It is often very difficult to differentiate these ; and therefore in some cases the diagnosis must be pelvic inflammation, probably cellulitic or peritonitic, as the case may be.

COURSE AND RESULTS.

Very often the attack passes off and leaves no trace. The septic poison is too small in amount to do harm ; or it sets up some inflammatory exudation, which mechanically arrests progress, and then becomes absorbed. The vitality or health of the tissue and the strength of the poison have also their share in determining its progress. Exudation may take place and may be absorbed almost completely, may suppurate slowly and only to a limited extent, or may form a large abscess. This abscess may open into the bowel or bladder, or pass below Poupart's ligament, or upwards beneath the kidney. Rarely does it appear in the perineum, or pass through the sciatic notch to the buttock. In one case where the last occurred, the patient complained of a very deep-seated pain just over the notch.

It is valuable to note how rarely the abscess perforates into the peritoneal cavity. The peritoneal surfaces of the abdominal contents are in contact ; and as the inflammatory attack spreads, it sets up a peritonitis,

gluing the adjacent surfaces together. When pus does enter the peritoneum, it sets up a rapidly fatal peritonitis.

PROGNOSIS.

This depends on the extent of the inflammatory attack, and its effect on the patient's health. Its septic origin usually causes anxiety; but it does not spread so rapidly as peritonitis. Resolution of inflammatory deposits is slow. Pathological anteflexion gives rise to troublesome dysmenorrhœa and sterility. Prognosis should always be guarded as to complete recovery.

TREATMENT.

The general and the local treatment are exactly the same as in pelvic peritonitis. The occurring of suppuration is indicated by rigors and should be hastened by the hot douche and poultices. We may have only part or parts of the exudation suppurating, so that in a cellulitic swelling we may have inflammatory exudation containing separate abscess cavities. In these, tapping with Matthieu's aspirator is very good, and may be often repeated. Care should be taken that the aspiratory needle has been purified in carbolic lotion (1–20), and prior to introduction dipped in carbolic oil (1–20).

When pus is present in large quantity, the treatment varies according to the part at which it points.

(1.) If it point below Poupart's ligament, in the buttock, or behind the kidney, it is to be opened under Listerism and a drainage-tube inserted. Results by this method are admirable.

(2.) If it bulge in the vaginal roof, it should be opened as follows: Pass Sims' speculum, and open into the cavity with Paquelin's cautery at a dull heat; make the opening big enough to admit two good sized drainage-tubes. Daily irrigate the cavity with weak carbolic lotion (1–100) or boracic lotion (1–30). If the discharge is profuse it may be received into pads of salicylic cotton-wool placed over the vulva; oakum or marine lint may be used among poor people.

The drainage-tubes should be double, and with a small piece at the end at right angles, which prevents them slipping out. They should not be perforated, as this prevents the washing out. If only straight tubes can be had, a small piece of ivory can be stitched to the upper end.

During suppuration, tonics and nutritious diet should be given.

CHAPTER XVI.

PELVIC HÆMATOCELE.

LITERATURE.

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Synonyms—Retro-uterine Hæmatocele: Uterine Hæmatocele.

This subject will be considered under the same heads as the preceding.

Preliminary Considerations.—The abundant venous supply of the pelvic organs, the congestion induced by menstruation, and the hemorrhage accompanying the monthly rupture of the Graafian follicle, render women peculiarly liable to hemorrhages into the pelvic cavity. Yet it is astonishing that it is only since 1850 that this subject has really attracted gynecologists' attention. It was in that year that Nélaton gave the subject due prominence; although Voisin (1810), Recamier, Bourdon (1841), Ollivier, and Bernutz had all recorded cases, under such titles as "Blood-gush from an Aneurism of the Ovary," "Blood-Cysts of the Pelvic Cavity." Nélaton had diagnosed his case as an abscess, and opened it with a bistoury; the blood and blood-clots escaping from the incision showed its real nature

unmistakably. Since that time, pelvic hæmatocele has taken its place in gynecology as a serious and important *symptom.*

Nature.—*An effusion of blood, usually into the pelvic peritoneum, sometimes beneath it; enclosed either by anatomical structures or previously existing inflammatory adhesions.*

Many will consider this definition unsatisfactory; it must be taken, however, in connection with the following remarks. Pelvic hæmatocele is not a disease. It is only a symptom of some previously existing pathological condition of the pelvic organs, just as hæmoptysis is not a disease but usually a symptom of some lung condition. We have limited the term hæmatocele to hæmorrhages into the pelvic cavity.

It is disputed whether the inflammation encysting and limiting the hemorrhage is antecedent or consequent to it. The former view has much more evidence in its favour, although some cases support the latter. This, however, belongs more especially to pathological anatomy.

It may be urged that we have limited the term pelvic hæmatocele to hemorrhages enclosed by anatomical relations or inflammatory adhesions. We do this, however, for the following reason. The hemorrhage gives no physical sign until enclosed, and is no more palpable to the finger examining through the fornices than the intestines or ascitic fluid are. Fluid blood in the pelvis can only be diagnosed by abdominal incision or *post-mortem.*

PATHOLOGICAL ANATOMY.

Post-mortem cases are rare, but enough have been recorded to give us some idea of its pathology.

In almost all the cases, the blood is found enclosed by pelvic inflammatory adhesions, apparently antecedent. Dr. Lauchlan Aitken has recorded a case which, during life, presented the usual physical signs of retro-uterine hæmatocele, viz., a retro-uterine tumour bulging into the posterior fornix vaginæ and displacing the uterus markedly forward; and in which, on *post-mortem,* clotted blood, not enclosed by adhesions, was found behind the uterus.

Usually, however, the tumour when retro-uterine has, as its boundaries, the uterus and broad ligaments in front and the sacral peritoneum behind; while, above, it is roofed in, as it were, by adherent intestine or by the retroverted and adherent uterus. The uterus is markedly driven forward by the effusion.

Sometimes the blood is found effused between the layers of the broad ligament, which limits it unless the effusion is so great as to perforate a

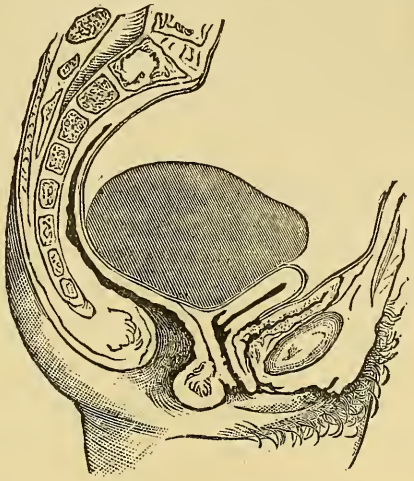


Fig. 120.
Retro-uterine hæmatocele. Pouch of Douglas previously obliterated by inflammation.

lamella and escape into the peritoneum. Occasionally the blood is below the peritoneum and dissects it up as it escapes from the vessels; or it is found in the cellular tissue of the pelvis.

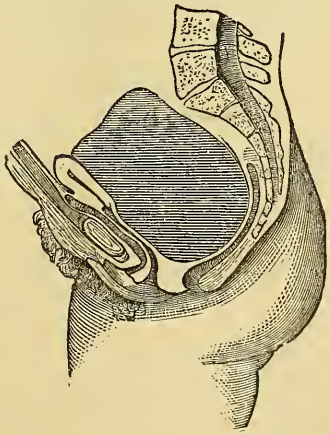


Fig. 121.
Retro-uterine hæmatocele. Pouch of Douglas not previously obliterated (Schroeder).

It is of the highest pathological importance to note that in a very large proportion of the cases diseased ovaries have been found; changes

in the Fallopian tubes (dilatation and filling with blood or pus) being less common.

The effused blood undergoes changes in course of time, so that blood-crystals, granular corpuscles and oil drops are found as traces of the previous blood effusion. When the patient dies soon after the hemorrhage, the blood is merely clotted. In most cases of recovery it becomes entirely absorbed.

ETIOLOGY—SOURCES OF HEMORRHAGE AND VARIETIES.

The table quoted below shows that pelvic hæmatocele is most common in women between the ages of 25 and 35, that is, women in their period of full menstrual and sexual vigor. Out of 43 cases, the ages, according to Schroeder, were as follows:—

In	3	cases, or	7.0	p. c., the ages were	22–25
"	14	"	32.5	" "	25–30
"	13	"	30.2	" "	30–35
"	9	"	20.9	" "	35–40
"	3	"	7.0	" "	40–43
"	1	"	2.2	" "	53

It is also most common in multiparæ, and occurs in about 4 or 5 per cent. of specially female diseases.

The following are the chief causes of hemorrhage, and its anatomical sources:

1. *Predisposing Causes.*—Profuse menstruation; violent exercise during menstruation, such as dancing; violent coitus during menstruation; varicose conditions of the subperitoneal veins; purpura; scorbutus; hæmophila.

2. *Anatomical Sources.*—(*a.*) *Pelvic Peritoneum.*—There may be rupture of veins of the pampiniform plexus, or of the veins below the uterine peritoneum. In the former case, we may get the blood pouring directly into the peritoneum; or first passing between the layers of the broad ligament, and either remaining enclosed there or rupturing into the peritoneum. The hemorrhage, according to Virchow, may arise from vessels developed in the false membranes of pelvic peritonitis. Crede, of Leipzig, quotes a case where he tapped a tumor and first got serum, then blood-stained serum, and finally blood. In two days, a fresh tapping first gave putrid blood and then fresh blood in abundance.

(*b.*) *Connective Tissue.*—Rupture of veins occurs here also.

(*c.*) *Uterus.*—We may have regurgitation in menorrhagia from the uterus along the dilated Fallopian tubes. Rupture of interstitial extra-uterine pregnancy is another cause of hemorrhage.

(*d.*) *Fallopian Tube.*—Blood may come from its hyperæmic mucous membrane. More usually it arises from rupture of an extra-uterine pregnancy there.

(*e.*) *Ovary.*—Here it results from rupture of congested vessels, of the Graafian follicles, or of extra-uterine pregnancy in Graafian follicles.

Of all these causes, rupture of veins below the peritoneum, and rupture of Fallopian tube and ovarian pregnancies are the most common. The student will now clearly see the *symptomatic nature* of hæmatocele.

Varieties.—We have adopted "pelvic hæmatocele" as a convenient general term. When the blood effusion is retro-uterine and intra-peritoneal, then "retro-uterine hæmatocele" is the term usually employed.

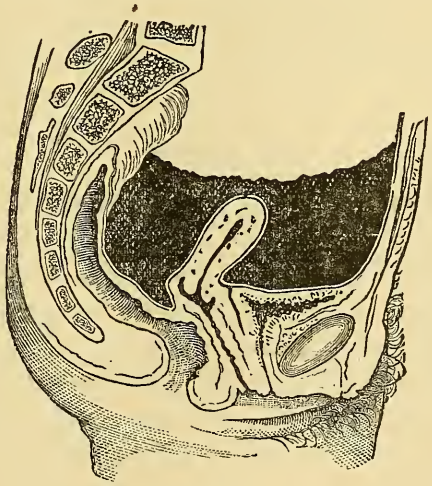


Fig. 122.
Copious blood-effusion ante and retro-uterine.

In cases where the blood effusion is copious, it may flow up to the anterior fornix, "ante-uterine hæmatocele;" when beneath the peritoneum —extra-peritoneal—and extensive, it may be termed "peri-uterine." An effusion into the connective tissue is conveniently termed *hæmatoma.*

All these may be classed under two heads, viz.:—

1. Intra-peritoneal, *i.e.*, blood effusion into the pelvic peritoneum; the most common class.

2. Extra-peritoneal, *i.e.*, blood effusion beneath the peritoneum, between the layers of the broad ligament or deep in the connective tissue.

SYMPTOMS.

The chief symptoms are menorrhagia, sudden onset, sudden bloodlessness, pain. The pulse may become feeble from anæmia, and the temperature is not above normal. Menorrhagia is not always present, and the bloodlessness may not be very well marked; sometimes patients have a sudden faint feeling. In cases of copious effusion from rupture of an extra-uterine pregnancy, the symptoms are often like those of irritant poisoning, viz., sudden onset, prostration, vomiting. The marked anæmia, however, points to some internal hemorrhage; inquiry should then be made as to menstruation, and this always followed by bimanual examination.

In retro-uterine hæmatocele, we find frequent painful micturition and difficulty in evacuation of the bowels. There is no retention of urine.

PHYSICAL SIGNS.

These are sometimes negative; often characteristic, especially in retro-uterine hæmatocele.

Blood effused into the pelvic peritoneum, and neither coaguluted nor enclosed by adhesion, is not palpable to examination, and does not cause the pouch of Douglas to bulge downwards (Fig. 123). It will be pressed out of the pouch of Douglas, as the bladder distends, and return into it when it empties. It is often said that the effused blood naturally gravitates into the pouch of Douglas. It does not do so. It lies in the pouch of Douglas only *because it has been effused near it;* and it causes the pouch of Douglas to bulge down only *when it is effused below adhesions* which limit its spreading up. Blood has a specific gravity of 1055, and remains where it has been effused. Yet effused blood is often spoken of as if it were lead, sinking down whenever it got out of the blood-vessels.

When, however, blood is poured out near the pouch of Douglas and below adhesions, we get the following characteristic state. On abdominal palpation, a tumour may be felt. On vaginal examination a firm convex bulging tumour is felt, varing in size from a billiard-ball to a child's head and sometimes filling up a large part of the pelvic cavity; the os uteri is

pressed close behind the symphysis, looks downward and is often almost inaccessible (Fig. 121). A good plan to get at it is to turn the index finger palmar surface to the symphysis, and push it well up. *On bimanual examination, the fundus uteri is felt usually distinct, just below the abdominal*

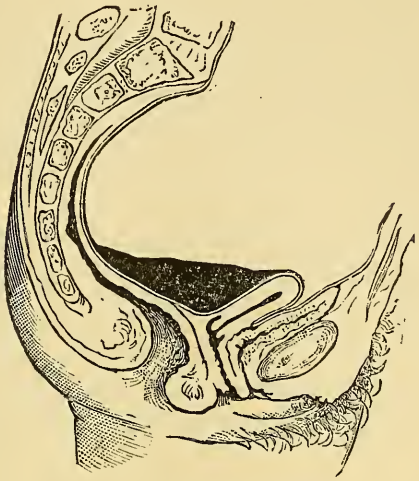


Fig. 123.

Free blood not causing pouch of Douglas to bulge down.

walls, just behind the symphysis, and generally to one or other side. This settles the point that the retro-uterine tumour is not the uterus. The sound confirms the bimanual as to the position of the uterus, but is not as a rule necessary.

When the effusion is into the broad ligament the exact diagnosis is more difficult. Such cases are usually found on post-mortem or operation. During life, reliance must be placed on symptoms, viz., sudden occurrence, and absence of inflammation at first. The physical signs in large peri-uterine effusions are that the bulging is round the uterus, and that it is not confined to the pouch of Douglas. *Hæmatoma* is difficult to diagnose, and is probably often mistaken for a cellulitic deposit.

When the blood effusion is large, the patient may sink before any very definite physical signs are found. We have taken the view that pelvic peritonitis is usually antecedent to the hæmatocele. At the same time we always have a resulting peritonitis coming on in a day or two, this being indicated by increased pulse and temperature and by tenderness on pressure.

All that has been given here is only how to diagnose the *symptom* of the occurrence of hemorrhage. The diagnosis of the condition causing the hemorrhage is, unless in the case of extra-uterine pregnancy, as yet beyond our clinical knowledge.

DIAGNOSIS AND DIFFERENTIAL DIAGNOSIS.

Pelvic hæmatocele requires to be diagnosed from—

Pelvic peritonitis followed by enclosed serous effusion in pouch of Douglas,
Pelvic cellulitis,
Fibroid on posterior wall of uterus.
Ovarian cyst behind uterus,
Extra-uterine pregnancy,
Retention of blood in horn of maldeveloped uterus,
Retroversion of non-gravid or gravid uterus.

Of these we consider at present only pelvic peritonitis and pelvic cellulitis.

In these two purely inflammatory affections we have the inflammatory symptoms from the first, without a history of sudden onset or of menorrhagia. Further, the difference in etiology of hæmatocele and peritonitis will help us. The history is of the greatest service.

COURSE AND RESULTS.

In many cases (four-fifths according to Voisin) the blood effused becomes entirely absorbed, in a time varying from 2 to 10 months.

The tumour, with partially clotted or purulent contents, may burst into the rectum, vagina or peritoneal cavity: in the last case, fatal peritonitis follows.

When the blood effusion is very large, death may be rapid.

PROGNOSIS.

As to Life.—This is, as a rule, settled soon. The most fatal cases are extra-uterine pregnancies, and rupture of varicose vein into the peritoneum with no peritonitic adhesions to limit the blood effusion. After peritonitis is set up, the prognosis is much as in pelvic cellulitis.

TREATMENT.

(1.) *At onset of hemorrhage.*

(2.) *When suppuration occurs.*

(1.) *At Onset of Hemorrhage.*—The treatment here is expectant. The patient is to be put at complete rest, with ice-bags to the abdomen. Ergotine should be injected into the buttock. If the patient is collapsed, then stimulants and hypodermic injections of sulphuric ether or whiskey must be freely used. In most cases, the source of the bleeding is unknown ; the present state of knowledge does not enable us to lay down any rule as to the opening of the abdominal cavity and the attempt to ascertain and secure the bleeding source. In Fallopian tube pregnancies which have burst, the abdomen has been incised and the tube ligatured on either side of the rupture ; but no case of cure has been reported so far as we know. The plan of incising the retro-uterine tumour and clearing out clots is wrong ; it simply leads to more bleeding from rupture of adhesions. When absorption is going on, the treatment is just as in pelvic peritonitis.

(2.) *After Suppuration has occurred.*—The tumour is to be opened and drained, as recommended at p. 174 for suppurating pelvic cellulitis.

Recently, Mr. Lawson Tait has recommended that some pelvic abscesses be opened by abdominal section, as we often get very tedious cases when they perforate into the bowel. The following was the treatment in one of six cases in which he performed it. "I determined to open it from above. . . . I found a large cavity containing about two pints of fetid pus with decomposing blood-clots. This I carefully cleansed out, and after having united the edges of the opening into the cyst carefully to the abdominal wound, I fixed in one of Kœberle's drainage-tubes five inches long. . . . The patient went home cured on the 30th day."

Tait's cases were chiefly suppurating hæmatoceles (Tr. of Lond. Med. Chir. Soc., vol. 62).

SECTION IV.

AFFECTIONS OF THE FALLOPIAN TUBES AND OVARIES.

CHAPTER XVII. Fallopian Tube; Parovarium; Round Ligament; Broad Ligament; Tubo-ovarian Cysts.

" XVIII. Malformations of Ovary; Ovaritis and Periovaritis; Displacements of Ovary—Hernia; Prolapsus.

" XIX. Battey's Operation.

" XX. Pathology of Ovarian Tumours.

" XXI. Diagnosis of Ovarian Tumours.

" XXII. Operative Treatment of Ovarian Tumours.

CHAPTER XVII.

FALLOPIAN TUBE; PAROVARIUM; ROUND LIGAMENT; BROAD LIGAMENT; TUBO-OVARIAN CYSTS.

LITERATURE.

Bandl—Op. cit. *Barnes*—Op. cit., p. 376. *Hennig*—Krankheiten der Eileter und die Tubarschwangerschaft: Stuttgart, 1876. *Duncan*—Clinical Lectures: Lond., 1879. *Kiob*—Pathologische Anatomie der weiblichen Sexualorgane: Wien, 1864. *Noeggerath*—The Vesico-vaginal and Vesico-rectal Touch: Am. J. of Obst., VIII., p. 123. *Simpson, J. Y.*—Op. cit., p. 539. *Schroeder*—Op. cit., S. 329. *Tait*—Menstrual Fluid retained in the Left Fallopian Tube simulating Ovarian Tumour: Br. Med. J., 1878, p. 677. *Thomas*—Op. cit., p. 760. *Williams*—Ovarian Tumours: Reynolds' System of Medicine, Vol. V. *Wells, T. S.*—Diseases of Ovaries: London, 1873. For other literature see Bandl, whose work and that of Hennig we mainly follow.

FALLOPIAN TUBE.

Preliminary Considerations.—The anatomical relations of the Fallopian tubes have been already considered (p. 20). Functionally, they act as ducts along which the spermatozoids pass to fertilise the ovum; and along which the ovum, fertilised or non-fertilised as the case may be, is carried to the uterine cavity. So far as we know this is all their physiological function, unless we hold with Tait that they play some important though as yet undefined part in menstruation. Pathologically, the Fallopian tubes are important from the occurrence of extra-uterine pregnancy in them and their occasional dilatation with pus or blood. From the fact that they open on the one hand into the uterus, and on the other hand into the peritoneum, very serious results may follow from fluid accumulations in them, from spreading gonorrhœa, or from injections into the uterus.

Can the normal Fallopian tube be palpated in the Bimanual? The student will probably have already noted that, in considering the bimanual (p. 101), we did not name the Fallopian tubes as structures whose form and limits he was expected to define. In a very favourable case, the conjoined man-

ipulation may define them at their uterine origin—more especially if the rectal examination be made and the uterus be well drawn down with the volsella. Noeggerath has pointed out that they may be defined in those cases where the finger is passed along the urethra to explore the interior of the bladder, an operative procedure to be described afterwards. Practically the Fallopian tubes, unless much dilated, are not palpable to ordinary examination.

Catheterisation of the Tubes.—In certain undoubted cases the uterine sound has been passed along the Fallopian tube, while in others the supposed sounding of the tube has been really the perforation of the uterine wall. It is impracticable to sound the normal Fallopian tubes to any effect; and the procedure, or rather the attempt, is by no means devoid of danger.

We now take up their pathological conditions under the heads of—

Abnormalities,
Stricture and Occlusion,
Patent Condition of the Tubes,
Inflammatory Conditions of the Tubes,
Hydrops Tubæ,
Pyosalpinx and Hæmatosalpinx,
New Formations.
Extra-uterine Fœtation (to be considered under Section IX.).

ABNORMALITIES.

These are of little practical interest. The chief one is an accessory fimbriated end.

STRICTURE OF THE TUBES.

The tube may have a congenital stricture; or may become closed at the uterine or the fimbriated end or in the middle. When stricture occurs at the uterine end, it is caused by implantation of the placenta there or by endometritis with adhesion. In the middle, small tumours or adhesions may cause stricture—in the latter case usually partial. At the fimbriated end, the occlusion is due to a catarrh of the tubes which has spread to the peritoneum and set up adhesive peritonitis.

These strictures are of importance in relation to sterility and fluid accumulations, but cannot be diagnosed during life.

PATENT CONDITION OF THE TUBES.

By this is meant undue dilatability. It is of great importance in relation to uterine injections. Even in careful injection of the uterine cavity, post-partum or otherwise, fatal results have followed from the fluid passing along the tube into the peritoneal cavity. "Forcible uterine injections on the cadaver, with the cervix entirely filled up by the syringe, almost always sent fluid along the tubes into the peritoneal cavity. Less forcible injections under like conditions sent the fluid along a less distance (2–3 mm.), and often sent it into the veins; while gentle injections with a tube not filling the cervical canal sent fluid neither into the tubes nor

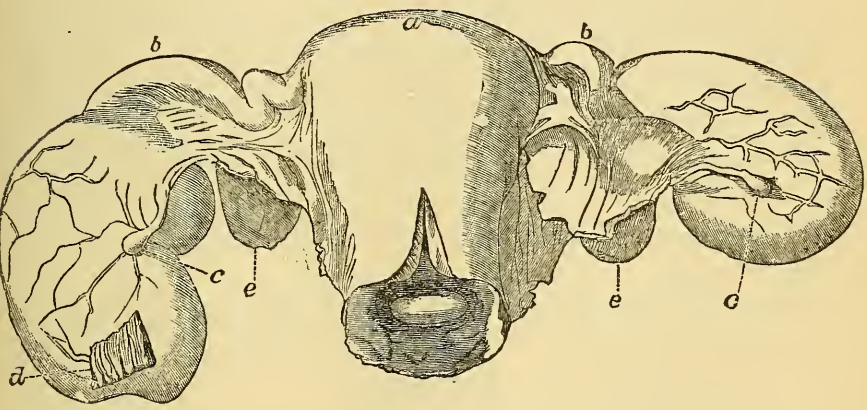


Fig. 124.

Hydrops tubæ: *a*, uterus with cervix laid open in front; *bb*, Fallopian tubes; *cc*, hydrops; *d*, part of an inflammatory adhesion; *ee*, ovaries (Hennig).

veins." Bandl, from whom the above is taken, records a case where death resulted from injection of an aborting uterus with perchloride of iron, although the injection-pipe was less in diameter than the cervix. The death may be immediate from shock, or some days after from peritonitis. In uterine injections no more than 1–4 drops should be used.

INFLAMMATORY CONDITIONS OF THE TUBES, CATARRHAL SALPINGITIS.

The Fallopian tube has three layers—peritoneal, muscular, and mucous. An inflammatory condition of the peritoneum (perisalpingitis) is simply part of ordinary pelvic peritonitis, is not diagnosable, and is not in itself of any importance. The same may be said of mesosalpingitis (inflammation of the muscular coat).

Catarrh of the mucous membrane lining the Fallopian tube (catarrhal salpingitis) is not idiopathic, but is secondary to endometritis.

Pathological Anatomy.—In acute catarrh in adults the tube contains neutral or acid mucus in excess, glandular cells, and ciliated epithelium.

Chronic catarrh is more frequent than acute, and occurs in all degrees from a simple hyperæmia to the formation of pus. The tube is often dilated and may communicate with a cavity in the ovary.

As the condition is not *diagnosable* during life no *treatment* can be indicated.

HYDROPS TUBÆ.

As the result of stricture of the tube and marked catarrh, we get the tube distended with serum (hydrops tubæ) or pus (pyosalpinx).

Pathological Anatomy.—The whole or only a part of the tube is dilated, according to the locality of the stricture (Fig. 124). There may be several strictures and thus several cysts. The tube distends and atrophies, so that the mucous membrane becomes thin and the muscular coat disappears. The fluid is usually serum with cholesterine and occasionally blood.

It is alleged that fluid can accumulate in the tube although the uterine end is open; the fluid, at a certain stage of its accumulation, flows into the uterus (profluent dropsy of the tube).

Physical Signs.—An elongated tortuous tube is found at one side of the uterus and high up in the pelvis. Usually a small piece of the undilated tube can be felt between the sac and the uterus.

The *Differential Diagnosis* must be made from the following:—

(1.) Inflammatory conditions or blood extravasation in the broad ligament;
(2.) Fallopian tube pregnancy;
(3.) Small ovarian cyst;
(4.) Parovarian cyst;
(5.) Retention of blood in maldeveloped uterus.

Treatment.—When adhesions are present we should puncture with Matthieu's aspirator through the lateral fornix. When the dilated tubes are free, or but partially adherent, they may be removed by abdominal incision, as Lawson Tait has recently done.

PYOSALPINX.

This is acute or chronic, and consists in the accumulation of pus in the tubes.

Diagnosis and Treatment is much as in hydrops tubæ. If the tube burst, a fatal peritonitis is set up; adhesions may form and perforation into the vagina or rectum ensue.

HÆMATOSALPINX.

This is a rare condition in which the blood from the congested mucous membrane of the tube is detained there and dilates it. It is often associated with retention of menstrual blood in the uterus (*v.* Atresia Vaginæ). *Diagnosis* is difficult; Bandl records one case where he diagnosed the condition as a fibroid, and Lawson Tait one simulating an ovarian cyst. Rokitansky indeed has said, "Die Gynäkologen erkennen leider diesen Zustand zu spät" (Gynecologists diagnose this condition, unfortunately, too late).

NEW FORMATIONS.

These we merely enumerate. They are connective-tissue growths, lipomata, primary tuberculosis, carcinomata.

PAROVARIUM.

We have already described the rudimentary structure known as the parovarium. Sometimes one or more, usually one, of the tubules becomes distended with fluid. This distention may be very great and constitutes the tumour known as parovarian; its consideration will be best deferred till we treat of Ovarian Tumours.

ROUND LIGAMENT; HYDROCELE.

LITERATURE. *Goodell*—Lessons in Gynecology: Philadelphia, 1880. *Schroeder*—Op. cit., S. 417. *Thomas*—Op. cit., p. 136. *Wile*—Hydrocele in the Female: Am. J. of Obst., July, 1881, which see for further literature.

Nature and Pathological Anatomy.—This is a rare malady, and may exist as encysted fluid round the round ligament (extra-peritoneal), or in the canal of Nuck—a process of peritoneum extending from the internal inguinal ring into the labium majus. It may be closed at the internal

ring, thus forming a cyst; or it may communicate with the peritoneal cavity.

The fluid is serous in its nature; it may be olive green in colour. The authors have seen three cases—one extra-peritoneal, two intra-peritoneal.

Physical Signs. (*a.*) *Of encysted hydrocele of the cord.*

An oval translucent swelling exists in the inguinal canal. It cannot be returned into the abdominal cavity, has usually existed for some time, is not tender on pressure, and gives rise to no symptoms. It must be differentiated from an ovary in the inguinal canal, and from incarcerated hernia.

(*b.*) *Of hydrocele in the labium majus.*

The labium majus is distended with a fluctuating tumour, dull on percussion and of translucent appearance; usually the contents cannot be returned into the abdominal cavity. Aspiration gives a clear fluid. It is to be diagnosed from hernia in the usual way.

Treatment.—Aspiration and drainage; or aspiration and injection of a few drops of tincture of iodine. Goodell recommends that when the labial form communicates with the abdominal cavity, the internal ring should first be firmly compressed and the injected fluid then sucked out.

BROAD LIGAMENT.

Hæmatocele and inflammatory conditions of the broad ligament have been already considered. We need only further mention that we may have small cysts, fibroids (rare), phleboliths, cancer, and tuberculosis; the last two are only parts of the general peritoneal affection.

TUBO-OVARIAN CYSTS.

These result from adhesions between the fimbriated end of the Fallopian tube and the ovary with degeneration of the corpora lutea of the Graafian follicles thus enclosed. The contents may be poured into the uterus along the tube.

CHAPTER XVIII.

MALFORMATIONS OF OVARY; OVARITIS AND PERIOVARITIS; DISPLACEMENTS OF OVARY—HERNIA; PROLAPSUS.

LITERATURE.

Barnes—Op. cit., p. 297. *Englisch*—Oesterr. Med. Jahrbuch, 1871, p. 335; or, Sydenham Year Book, 1871-72, p. 293. *Freund*—Die Lage und Entwickelung der Beckenorgane: Breslau, 1863. *Herman*—Prolapse of the Ovaries: Med. Times and Gazette, October 22, 1881. *Klob*—Pathologische Anatomieder weiblichen Sexual Organe: Wien, 1864. *Mundé*—Prolapse of the Ovaries: Am. Gyn. Tr., 1879, p. 164. *Olshausen*—Die Krankheiten der Ovarien: Billroth's Handbuch, Stuttgart. *Schroeder*—Op. cit., S. 341. *Schultze*—Op. cit.

We first take up some preliminary considerations.

Palpation of Normal Ovaries.—After the student has had practice in the bimanual, he will probably meet with some favourable case where he is able to feel the normal sized ovary. This is best done as Schultze recommends. To map out the right ovary, use the index and middle fingers of the right hand internally and the left hand externally; for the left ovary, the left hand is used internally, and the right externally. The patient should lie on her back, with the knees drawn up and the legs rotated outwards. This rotation of the knees renders the psoas muscles tense, thus making their inner edges (which Schultze gives as a guide to the position of the ovaries) more easily palpable. Normally, they lie at about the level of the pelvic brim, half-way between the Fallopian tube angle of the uterus and the psoas.

Another method of palpating the ovaries is to draw down the uterus with the volsella, and make the examination with the finger per rectum.

MALFORMATIONS OF OVARY.

Absence of one or both ovaries, or rather their very rudimentary development, is generally only part of maldevelopment of the uterus. Oc-

casionally a third ovary is present—a fact worth keeping in mind in relation to Battey's operation (Chap. XIX.).

OVARITIS AND PERIOVARITIS.

Synonyms—Oophoritis: Peri-oophoritis.

Nature.—An acute or chronic inflammation of the ovary.

PATHOLOGICAL ANATOMY.

Acute Ovaritis.—In this we recognize two forms occurring in the two subdivisions of ovarian tissue, the follicular or parenchymatous, and the interstitial.

In the *follicular form*, the ovary is not much enlarged; but we find, on microscopical examination, the peripheral follicles increased in size, their contents turbid or purulent, and the cells of the membrana granulosa in a state of cloudy swelling. Usually the surrounding tissue participates, though to a less marked degree, in the inflammatory changes.

In the *interstitial form*, the ovary is increased in size and its connective tissue elements are proliferated. Pus may form, and often there are small apoplexies (Olshausen).

Chronic Ovaritis.—As the result of this, we get destruction of the follicles and a cirrhotic condition of the organ. Occasionally the ovary remains distinctly larger. Whether or not we get a super-involution of the uterus as the result of severe and double ovaritis, is not as yet settled.

ETIOLOGY.

The causes of ovaritis are the following:

1. Gonorrhœa, latent gonorrhœa in the male;
2. Instrumental exploration of the uterus;
3. Childbirth and abortion;
4. Acute febrile diseases;
5. Pelvic peritonitis.

Gonorrhœa.—The ovaries may be inflamed sympathetically, just as the testicles are in gonorrhœa of the male.

Instrumental Exploration.—Sometimes after the passage of the uterine sound, especially in difficult cases, the ovary becomes tender.

Childbirth and Abortion.—This is a common cause of ovaritis. Thus, in

27 septic cases at Halle, Olshausen found the ovaries affected in 13. Usually both ovaries are implicated.

Acute Febrile Diseases.—Cholera, the exanthemata, septicæmia, phosphorus and arsenic poisoning, have ovaritis as one of their results.

Pelvic Peritonitis.—It will readily be understood that ovaritis often occurs as part of general pelvic peritonitis.

The follicular form usually occurs in febrile diseases and pelvic peritonitis ; the interstitial form is generally puerperal.

SYMPTOMS AND PHYSICAL SIGNS.

Acute Ovaritis.—A case of simple acute ovaritis is not common. The patient usually complains of pain at the side radiating to the back, and of pain on pressure in the iliac fossæ.

When the bimanual is made, the ovary or ovaries are more accessible and are felt as mobile, tender, and somewhat enlarged bodies, often about the size of a walnut ; and pressure causes great pain of a sickening character. Owing to adhesions, the mobility may be wanting. The uterus is felt distinct from them.

Chronic Ovaritis.—The symptoms and physical signs are just as in the acute form, but much less marked and with a chronic history. Menorrhagia is often present. Sympathetic pain is sometimes felt below the left mamma.

DIFFERENTIAL DIAGNOSIS.

When the ovary is not fixed, there is nothing else with which it can be confounded.

PROGRESS AND RESULTS.

We may have resolution of the affection, adhesion, suppuration, and abscess. Sterility is a frequent result of double ovaritis ; hysteria is often present.

TREATMENT.

Acute Ovaritis.—A fly-blister should be applied over the appropriate iliac region, and the hot vaginal douche frequently used. Bromide of potassium may be given as follows :—

℞. Potassii Bromidi.....gr. xxx. to ʒ i.
Fiat pulv.: tales xii.
Sig. One powder at night.

Chronic Ovaritis.—The hot douche and occasional blisters are best. The glycerine plug is of value.

A glycerine plug is made as follows: take a square piece of absorbent cotton-wool about the size of the palm of the hand ; pour on its centre about ʒ ss. glycerine ; turn the corners over and squeeze the whole so as to saturate it ; lastly, tie a piece of thread about 8 inches long round it. Pass Sims' or Fergusson's speculum and place the plug in the fornix below the ovary. It should be left in for 18 to 24 hours, and then withdrawn.

This plug reduces congestion, owing to the affinity of glycerine for water ; has an antiseptic action ; and, as we shall afterward see, forms an admirable pessary. It sets up a watery discharge, so that the patient should be told to wear a diaper on account of this.

The following mixture is of use :

℞. Potassii Bromidi,
Potassii Iodidi.....āā ʒ ij.
Inf. Gentian..... ʒ vi.
Sig. Tablespoonful thrice daily.

PERIOVARITIS.

By this we understand an inflammatory affection of the tissues surrounding the ovary, which fixes the organ. It is a convenient clinical term for local peritonitic inflammations in the site of one of the ovaries. It is higher up than the usual cellulitic deposit. Its treatment is just as in chronic ovaritis.

DISPLACEMENTS OF THE OVARY—HERNIA.

The term *Hernia* is limited to those cases where the ovaries are present in the inguinal canals, in the obturator foramen (rare), or as part of an abdominal hernia. Percival Pott's case, where this first condition existed and where he excised both of the displaced organs, is the classical instance of this displacement. The usual form is where they are present in the inguinal canal.

ETIOLOGY.

Ovaries in the inguinal canal are usually congenital, having descended along the unobliterated process of peritoneum. In 17 out of 23 cases,

Englisch found it to be congenital; and in one-third of these, the hernia was double.

DIAGNOSIS AND DIFFERENTIAL DIAGNOSIS.

An oval tumour of the size of the ovary, tender on pressure, is found in the inguinal canal. Its connection with the uterus may be demonstrated by drawing the latter down with a volsella.

It requires to be diagnosed from an ordinary hernia, and from hydrocele of the round ligament.

TREATMENT.

A protecting shield may be worn; and where very troublesome, the ovaries may be cut down upon and removed. Reduction is usually impossible, owing to adhesions.

PROLAPSUS.

We have already considered the support of the ovary. Its attachments to the broad ligament, to its own special ovarian ligament, and to the ovarian fimbria of the Fallopian tube, support it directly. The infundibulo-pelvic ligament of the Fallopian tube does so indirectly; and, in addition, its own specific gravity has an influence in determining its level. The ovary has its position constantly changing. As the bladder fills, it is displaced backward; and during pregnancy, it is drawn upward out of its pelvic position and somewhat enlarged. The ovary is thus an organ liable to displacement, of which the most important is the downward one —known as *prolapsus of the ovary.*

PATHOLOGICAL ANATOMY.

The ovary may lie lower than usual, in the lateral or in the true pouch of Douglas; the uterus may be in its normal position, but oftener it is retroverted. The ovary is usually enlarged and often fixed by peritonitic adhesions.

Mundé considers the varieties of prolapsus as—

(1.) Retro-lateral, in the lateral pouch of Douglas;

(2.) Retro-uterine, in the true pouch of Douglas;

(3.) Ante-uterine, in the anterior fornix, very rare;

(4.) In the infundibulum of an inverted uterus. The authors have seen this last in a case under Professor Simpson's charge.

ETIOLOGY.

The conditions present in the puerperium favour displacement of the ovary for two reasons; the normal ascent of the uterus during pregnancy may stretch the ovarian ligament, and the ovary may not return to its normal size after parturition. Simple congestion of the organ may cause it to descend; and it is alleged that sudden jolts may also drive it below its normal site. It is not quite certain whether the congestion is cause or result. Probably it is the cause; but it is also aggravated by the displacement.

SYMPTOMS.

These are radiating pains, pain on defecation and coitus, a dragging sensation, reflex nervous symptoms with general irritability.

PHYSICAL SIGNS.

Bimanually, we feel in the true or in the lateral pouch of Douglas a small body or bodies, exquisitely tender and lying distinct from the uterus. By the rectal examination, the ovary is felt with unusual distinctness.

TREATMENT.

Blisters over the iliac region, hot vaginal douche, and bromide of potassium in fifteen-grain doses thrice daily. The bowels are to be opened by means of saline purgatives, such as the Friedrichshall water or Carlsbad salts. The following mixture is good.

℞. Magnesiæ Sulphatis ..... ℥ vj.
Quiniæ Sulphatis ..... gr. xxiv.
Acidi Sulph. dil ..... ℥ iij.
Tincturæ Capsici ..... ℥ j.
Aquam ..... ad ℨ vj.
Sig. Tablespoonful thrice daily.

This relieves the congestion by unloading the bowels.

Often the prolapsed and non-fixed organ becomes, after a week of this treatment, distinctly higher in position. The glycerine plug is then of the utmost value.

In the chronic stage, when the uterus is retroverted and not fixed, the ring or the Albert Smith pessary is good (*v.* Retroversion of Uterus).

The cases where the tender ovaries are fixed low down by adhesions are exceedingly difficult to treat. When the uterus is retroverted and fixed and the ovaries below it, we get one of the most troublesome cases possible. Palliative treatment by blisters and the hot douche is best; if the case is not amenable to this treatment and the patient's general

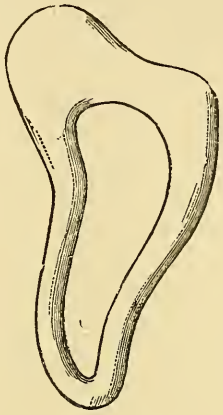


Fig. 125.

Mundé's pessary for prolapsed ovary. The cut away corner lies below the prolapsed ovary.

health is suffering, the propriety of Battey's operation should be considered.

Prolapse of the ovaries and their fixations are contra-indications to treatment indicated otherwise—such as Sims' division of the cervix and Emmet's operation.

In some cases of chronic unilateral prolapse, Mundé has found the pessary shown at Fig. 125 of value. It indicates the kind of variation of the form of the instrument required in different cases—as, for example, in double prolapsus or prolapsed ovary lying just behind the cervix.

CHAPTER XIX.

BATTEY'S OPERATION.

LITERATURE.

The literature on this operation is too extensive to be given in detail in a student's manual. The best summaries of cases are by Engelmann, Hegar, and Simpson. *Battey*—Battey's Operation: Transactions of International Medical Congress, Lond., 1881. See Am. J. of Obst., October, 1881, for discussion. *Engelmann*—The Difficulties and Dangers of Battey's Operation: Am. Med. Asso. Trans., 1878 (date of reprint); also Battey's, Operation, 3 fatal cases: Am. J. of Obst., July, 1878. *Hegar*—Die Castration der Frauen, Volkmann's Sammlung, Nos. 136–138. *Simpson, A. Russell*—History of a Case of Double Oophorectomy, or Battey's Operation: Br. Med. J., May 24, 1879. *Sims, J. Marion*—Remarks on Battey's Operation: Br. Med. Journal, 1877. For additional literature see American Gynec. Trans., 1879.

HISTORY OF OPERATION.

The real history dates from August 17, 1872, when Dr. Battey, of Rome, Georgia, U.S.A., successfully removed the ovaries of a patient who suffered from intolerable dysmenorrhœa. On July 27th of the same year, Hegar of Freiburg removed both ovaries in a case of severe ovarian neuralgia: the patient died and Hegar did not publish an account of the case. Blundell of London (1823), with that rare medical insight and experimental knowledge which led him to advocate—if not to practise—what recent obstetric science has shown to be the safest mode of performing the Cæsarean Section, had already thrown out the suggestion that the ovaries should be removed in dysmenorrhœa and to arrest hemorrhage in inverted uterus. To Battey, however, is due the honor of independently conceiving the idea, and—what was more difficult—of successfully carrying it into execution and impressing the profession with its importance and value in special cases.

NOMENCLATURE.

We have adopted the term Battey's Operation, first proposed by Marion Sims, as a convenient and useful one. Other terms, however, have been

proposed. The name "Normal Ovariotomy" is a misnomer, inasmuch as the ovaries are not normal. "Spaying," a term advocated by Goodell, does not recommend itself by its delicacy. "Die Castration der Frauen," the German name for the operation, is open to a similar objection.

NATURE AND AIMS OF OPERATION.

Battey's operation consists in the removal of both ovaries which, although diseased, are not appreciably enlarged. Battey proposed it for dysmenorrhœa, on the theory that it would bring on the menopause prematurely. This, however, does not occur as an immediate result. More recently, Battey has declared that he operates to arrest ovulation.

INDICATIONS FOR OPERATION AND ITS RESULTS.

These are not as yet strictly determined; *i.e.*, so far as our present knowledge goes, the operation is indicated in certain conditions but as yet we do not know whether in all of them it produces the anticipated effect. They are as follows :—

(1.) Intolerable dysmenorrhœa ;
(2.) Bleeding from fibroid tumours, uncontrollable by other means ;
(3.) Hystero-epilepsy, convulsions and threatened insanity, dependent on ovarian irritation or presence of ovaries with absence of uterus ;
(4.) Hydroperitoneum ;
(5.) Prolapsed and fixed ovaries.

(1.) *Dysmenorrhœa.*—In those cases where the patient has intolerable and prolonged pain every month, wearing her down and rendering habitual recourse to opiates necessary, the operation may be performed. It should not be forgotten that the results in such cases are not so brilliant as was once expected. The menstruation is not at first entirely arrested by the removal of the ovaries ; and, as we have always in such cases pelvic peritonitis adding to the patient's misery and untouched by the operation, it is evident that we must not expect too much from it. Lawson Tait believes that the Fallopian tubes must also be removed ; but on this point our information is scanty.

(2.) *Bleeding from Fibroid Tumours, uncontrollable by other Means.*—It is in this condition, for which Battey's operation was first advocated by

Trenholm and Hegar, that the most brilliant successes have been won. Not only has hemorrhage been checked, but the tumours themselves have diminished in size and even in some cases disappeared.

(3.) In some cases of *hystero-epilepsy, convulsions, insanity and dancing mania,* dependent on ovarian irritation, the operation has been performed with but moderate success. Engelmann, Gilmore, Russell Simpson, and Battey quote some remarkable cases.

(4.) *Hydroperitoneum.*—Granvill Bantock of London has recently recorded a case where removal of both ovaries cured the hydroperitoneum.

(5.) In cases of *ovaries prolapsed or fixed by adhesions* and giving rise to intolerable pain in coitus or seriously affecting the patient's health, their removal is called for.

At the London International Congress the operation was discussed. According to Battey, the mortality has been 22 per cent. for incomplete operations and 9½ per cent. for complete ; in the other cases, the results as to relief have been—

	No.	Per Cent.
Cured,	68	75
Greatly benefited,	15	17
Not benefited,	7	8
Of the incomplete operations—		
Cured,	3	18
Greatly benefited,	7	41
Not benefited,	7	41

The operators who have operated most extensively have been Lawson Tait of Birmingham, who has excised the ovaries in 70 cases, and Savage of Birmingham, who has done it in 30 cases.

Tait tabulates his cases as follows.

Cases operated on for pains—

	No. of Cases.	Incomplete Operations.	Deaths.
Recurrent Hæmatocele,	1	1	0
Abscess of Ovary,	2	0	0
Hydrosalpinx,	2	0	0
Pyosalpinx,	8	0	0
Chronic Ovaritis,	8	2	1
Cirrhosis of Ovaries,	11	1	0
	32	4	1

Cases operated on for hemorrhage—	No. of Cases.	Incomplete Operations.	Deaths.
Hydrosalpinx,	1	0	0
Chronic Ovaritis,	2	0	0
Small Cystic Ovaries,	5	0	0
Myoma,	26	1	5
	34	1	5
Cases operated on for Reflex Symptoms—			
Menstrual Epilepsy,	3	0	0
Deformity,	1	0	0
	4	0	0
Total number of cases,	70	5	6

METHOD OF PERFORMING THE OPERATION.

The ovaries may be removed (1) *by the vaginal method*, or (2) *by abdominal section*. As the former is the less usual method, we shall describe it but shortly.

(1.) *The Vaginal Method.*—Give chloroform. Place the patient semi-prone or, better, in the lithotomy posture. Pass Battey's speculum, lay hold of cervix uteri with a volsella and draw it down. Wash out the vagina thoroughly with the douche.

Now incise the posterior vaginal wall, behind the cervix, in the middle line for about an inch and a half. Open into the peritoneal cavity, pass in the index finger or long polypus forceps and hook down the nearer ovary; supra-pubic pressure is made by an assistant. Ligature the ovary at the hilus with thin carbolized silk threaded on a fixed needle. The hilus is transfixed mesially with the needle, the double ligature drawn through and cut, one thread is tied round the one half of the base and the other round the other half; the ovary is then cut off and the ligature cut short. The other ovary is treated in the same way; we make certain that there is not a third ovary, which would likewise require to be ligatured. Batty passes a temporary ligature round the base of the ovary and then uses the écraseur. Lastly, pass in a drainage-tube, stitch the wound (Battey leaves it unstitched), and irrigate twice daily with weak carbolic solution (1–100). After-treatment as in ovariotomy (*v.* Chap. XXII.).

This method is good when the ovaries are low down. It is sometimes

difficult to make out the ovary, and even impossible to remove it. In one case Battey had to dig out portions with his finger-nail; all was not removed and the patient conceived some time afterwards.

(2.) *Abdominal Section.*—The instruments needed are the following:—

Spray;
Carbolic lotion;
Sponges (a definite number);
Ordinary knives;
Probe-pointed bistoury;
Spatulæ;
Dissecting and dressing forceps;
Tenacula, blunt hooks;
Pean's artery forceps, a definite number (20) of pairs;
Needles on fixed handles;
Catgut for bleeding vessels;
Long straight needles, threaded two on each suture of silk-worm gut;
Needle-holder, with small needles on horse-hair sutures;
Thin carbolized silk for ligaturing ovary;
Drainage-tubes (glass);
Carbolic gauze, mackintosh, and flannel bandages.

The spray should be placed eight or nine feet from the patient. It is at present an open question whether the spray should play on the wound or merely into the air of the room. The instruments to be used are placed in a porcelain tray containing carbolic acid 1–40. The sponges are wrung out in 1–60 solution; when the peritoneal cavity is opened, the solution (1–60) used for the sponges must be *warm.*

The patient is placed in the dorsal posture and chloroformed; the skin is shaved clean, and washed with turpentine and soap and then with 1–20 carbolic lotion.

An incision, four inches long and ending a little above the mons veneris, is made in the middle line. The knife passes in succession through the following structures—skin, fat, linea alba, fascia transversalis and peritoneum. Bleeding is to be arrested by Pean's forceps left on for a time, or by catgut ligature.

Great care must be taken to recognize the *peritoneum.* It should be lifted up with a tenaculum and an opening cautiously made with a knife

or scissors. Remember that the small intestines lie just behind and may be easily cut into. This accident, indeed, has occurred to such a distinguished operator as Spencer Wells; when it occurs, the aperture should be stitched up with fine catgut. When once an opening has been made through the peritoneum, it can be readily enlarged to the size of the original incision by means of a probe-pointed bistoury guided on the finger.

The fingers are now passed in, the fundus uteri is touched; and then the fingers, carried along the Fallopian tube, will recognize the ovary usually lying behind it. It should be lifted up if possible to the incision, and ligatured with thin carbolized silk, as described under the vaginal method; the ligatures are cut short and each side of the pedicle held with Pean's forceps. (Marion Sims recommends his uterine repositor as an aid to the elevation of the ovaries. This elevation, however, can be more easily managed by introducing the two fingers or whole hand into the vagina, and elevating all in front of the posterior vaginal wall.)

The ovary is then cut away with the knife at a point about half an inch clear of the ligature. The other ovary is treated in the same way. We hold the pedicle for a time in the Pean's forceps, before dropping it back, to see that there is no bleeding. The peritoneal cavity is now to be thoroughly and carefully cleaned with sponges well wrung out of the warm carbolic solution (*vide* Chapter XXII.).

The abdominal incision is now closed; to prevent blood from passing down while this is being done, a large flat sponge, also well wrung out, is placed in the peritoneal cavity just below the incision. Silkworm-gut is most suitable for the deep sutures in the abdominal incision. Straight needles are threaded one on each end of the silkworm-gut suture; the needles are passed, first the one and then the other, from the peritoneal aspect towards the skin. All the sutures are passed before any one of them is ligatured, and the ends drawn together to judge if there be sufficient to close the wound. The sponge placed below the incision is now removed before the sutures are tied. *All the sponges and forceps must now be counted.* Superficial stitches of horse-hair are passed to adapt the edges of the skin between the deep sutures. If the operation has been an easy one, no drainage is needed.

The whole operation is by no means an easy one. The skin incision is more difficult than in ovariotomy, for there is always a risk of wounding intestine. In some cases, Hegar has made a lateral incision. Some-

times, especially in cases of fibroids, it is exceedingly difficult to get at the ovaries. Engelmann has more particularly directed attention to this point. In one of his cases he says: "The ovaries were so deeply imbedded within the folds of the broad ligament, and with them so firmly tied down to the sides and floor of the pelvis that it was impossible to move them. With the greatest difficulty several unsatisfactory ligatures were placed about the left ovary; but it was useless even to attempt to tie the right, so intimately was it blended with the broad ligament, and so immovably adherent to the pelvic walls. . . . I enlarged the incision to two inches above the navel, removed the intestine from the pelvic cavity and then succeeded in enclosing the entire mass in the ligature, and removing the ovaries complete." Kaltenbach in one case ruptured the Fallopian tube dilated with pus; the patient died of septic peritonitis. Freund, Martin, Sims, and Battey have also recorded difficult cases.

GENERAL CONCLUSIONS.

This operation is as yet on its trial. Gynecologists have not yet settled the exact indications for it, nor the question as to whether it is always worth the risk.

The mortality is high; up to 1879 it was 37.1 per cent. (A. R. Simpson).

Part of this is, of course, due to the worn-out state of many of the cases operated on and to the extensive adhesions present. Probably the mortality will diminish, although it must be kept in mind that operators have had the benefit of the previous advice and experience of ovariotomists as to its results. We have already seen that its most brilliant successes have been got in fibroids; its success in other cases has been moderate. When many adhesions exist, it is probably better not to attempt it.

Some interesting physiological points have been brought out by it; removal of the ovaries does not bring on the menopause, sexual appetite is not diminished, and no womanly attributes are in any way removed. The outcry that it unsexes a woman is absurd. The ovaries removed were probably useless for procreation; and when their presence is causing *serious* bodily illness, they are better removed.

CHAPTER XX.

PATHOLOGY OF OVARIAN TUMOURS.

LITERATURE.

Barnes—Op. cit., p. 322. *De Sinéty*—(*v.* Malassez). *Doran*—(*v.* Harris). *Drysdale* On the Ovarian Cell found in Ovarian Fluid: Trans. Americ. Med. Asso. (1873, date of reprint). *Foulis*—Cancer of the Ovary: Ed. Med. Jour., 1875, p. 838. The Diagnosis of Malignant Ovarian Tumours, and Malignant Peritonitis: Brit. Med. Jour., 1878, pp. 91 and 658. *Fox, Wilson*—On the Origin, Structure, and Mode of Development of the Cystic Tumours of the Ovary: Med. Chir. Tr., Vol. XLVII., p. 227. *Harris and Doran*—The Ovary in Incipient Cystic Disease: Jour. of Anat. and Physiol., Vol. XV., Pt. IV., July, 1881. *Malassez et De Sinéty*—Sur la Structure, l'Origine et le Developement des Kystes de l'Ovaire: Archiv. de Physiologie Normale et Pathologique, Vol. V., 1878, p. 343. *Noeggerath*—The Diseases of Blood-vessels of the Ovary in Relation to the Genesis of Ovarian Cysts: Am. Jour. of Obst., Vol. XIII., 1880. *Olshausen*—Op. cit. *Patenko*—Ueber die Entwickelung der Corpora Fibrosa in Ovarien: Virchow's Archiv., Bd. 84, 1881. *Rindfleisch*—Pathological Histology, New Sydenham Society Translation, 1873, p. 171. *Schroeder*—Op. cit., S. 355. *Slavjansky*—Zur normalen und pathologischen Histologie des Graaf'schen Bläschens des Menschen: Virchow's Archiv., Bd. 51, 1870. *Waldeyer*—Die Eierstockscystome: Archiv. f. Gynäk., Bd. 1, S. 252. *Wells, T. S.*—Diseases of the Ovaries: Churchill, London, 1872. *Williams*—Ovarian Tumours: Reynolds' System of Medicine, Vol. V. Olshausen, Schroeder and Williams give the literature well. They should be consulted for full references if necessary.

Under this head we take up—

1. *The mode of origin of ovarian cysts;*
2. *Varieties of ovarian tumours, their naked eye and microscopic anatomy;*
3. *The nature of ovarian fluids and of parovarian fluid;*
4. *Solid ovarian tumours; malignant tumours and the nature of the ascitic fluid associated with them.*

THE MODE OF ORIGIN OF OVARIAN CYSTS.

Our knowledge of the pathological anatomy of the ovary depends on our information as to its development, its anatomical structure, and the physiological changes it undergoes. On each of these we must make some preliminary remarks.

(1.) As to its *development.* We have already seen that the actively growing connective tissue of the ovary encloses the germ epithelium; that certain of the germ epithelial cells thus enclosed develop into ova; while the connective tissue itself, according to Foulis, forms the membrana granulosa (*v.* Plate VII., Fig. F.). The germ epithelium thus *enclosed* gave rise to the idea that the developing ovary was a tubular organ; and to the epithelium thus enclosed (or rather, according to Pflüger, the epithelium *penetrating* into the ovarian stroma) was given the name of Pflüger's ducts.

A section of a developed ovary shows cellular structures, which (according to Waldeyer) are some of Pflüger's ducts that have not developed as they should have done into Graafian follicles. Waldeyer, therefore, regards *Pflüger's ducts* as seats of origin of ovarian cysts (Fig. 126).

Fig. 126.

Cellular bodies alleged by Waldeyer to be enclosed germ epithelium which has not developed into normal Graafian follicles. He believes these to be one source of ovarian tumours (Noeggerath).

(2.) *The peculiarities of the anatomical structure* are due to the Graafian follicles and certain cellular structures whose exact nature is as yet debated. Of the 30,000 Graafian follicles contained in each ovary, only an insignificant number develop and rupture at each menstrual period. Many of the rest atrophy, forming the corpora fibrosa which are seen on section as fibrous points and contain no vessels; it is alleged that these corpora fibrosa may originate also from ripe follicles or from follicles where there has been hemorrhage.

The vessels around the follicles sometimes degenerate. The cellular structures shown at Fig. 127 are, according to Noeggerath, *diseased blood-vessels.*

Its Physiology.—When we consider that at each menstrual period a Graafian follicle distends and then ruptures, we are led to expect what really does sometimes occur, viz., that the follicle may not rupture but merely distend to form a pathological cyst. When pregnancy occurs, the ruptured follicle has its large corpus luteum filling it; and in this also we may have pathological development.

Fig. 127.

Cellular bodies which Noeggerath believes to be diseased blood-vessels and not germ epithelium, as Waldeyer asserts (Noeggerath).

From these preliminary considerations we see that the alleged sources for the origin of ovarian cysts are the following :—

(*a.*) Distention and coalescence of Graafian follicles ;

(*b.*) Degeneration of true corpora lutea ;

(*c.*) Degeneration of undeveloped Graafian follicles, colloid degeneration of the ovarian stroma ;

(*d.*) Degeneration of blood-vessels ;

(*e.*) Pathological development of enclosed germ epithelium, so-called Pflüger's ducts ;

(*f.*) Certain epithelial tubes running into the ovary ;

(*g.*) Malignant development of connective tissue of ovary.

The student should clearly note that these are the *theoretical* sources of ovarian cystic development, but that (as we shall presently see) some are disputed.

(*a.*) *Distention and Coalescence of Graafian Follicles.*—There can be no doubt that small cysts may so originate. The proof of this is positive, as Rokitansky found ova in cysts about the size of a bean. Wilson Fox has attempted to show, in his well-known paper, that all the varieties of cystic tumours may be formed in this way.

(*b.*) *Degeneration of true Corpora Lutea.*—This has been noted in some cases.

(*c.*) *Degeneration of undeveloped Graafian Follicles.*—This is probably an important source. (For details see Harris and Doran's article, and also Slavjansky's and Patenko's papers for normal and abnormal involution.)

(*d*, *e*, and *f*.) *Degeneration of Blood-vessels; Degeneration of Pflüger's Ducts; Epithelial Tubes running into the Ovary.*—Noeggerath of New York first pointed out that *diseased blood-vessels* might form a source of ovarian cysts; and, more recently, Harris and Doran have confirmed his views. According to Noeggerath, we have disease of the intima of the vessel, loss of its endothelium, and percolation of the contents of the vessel into the intima. Migrating cells accumulate in the interstices of the intima and break it up. The large granular nucleated cells found in ovarian cysts are,

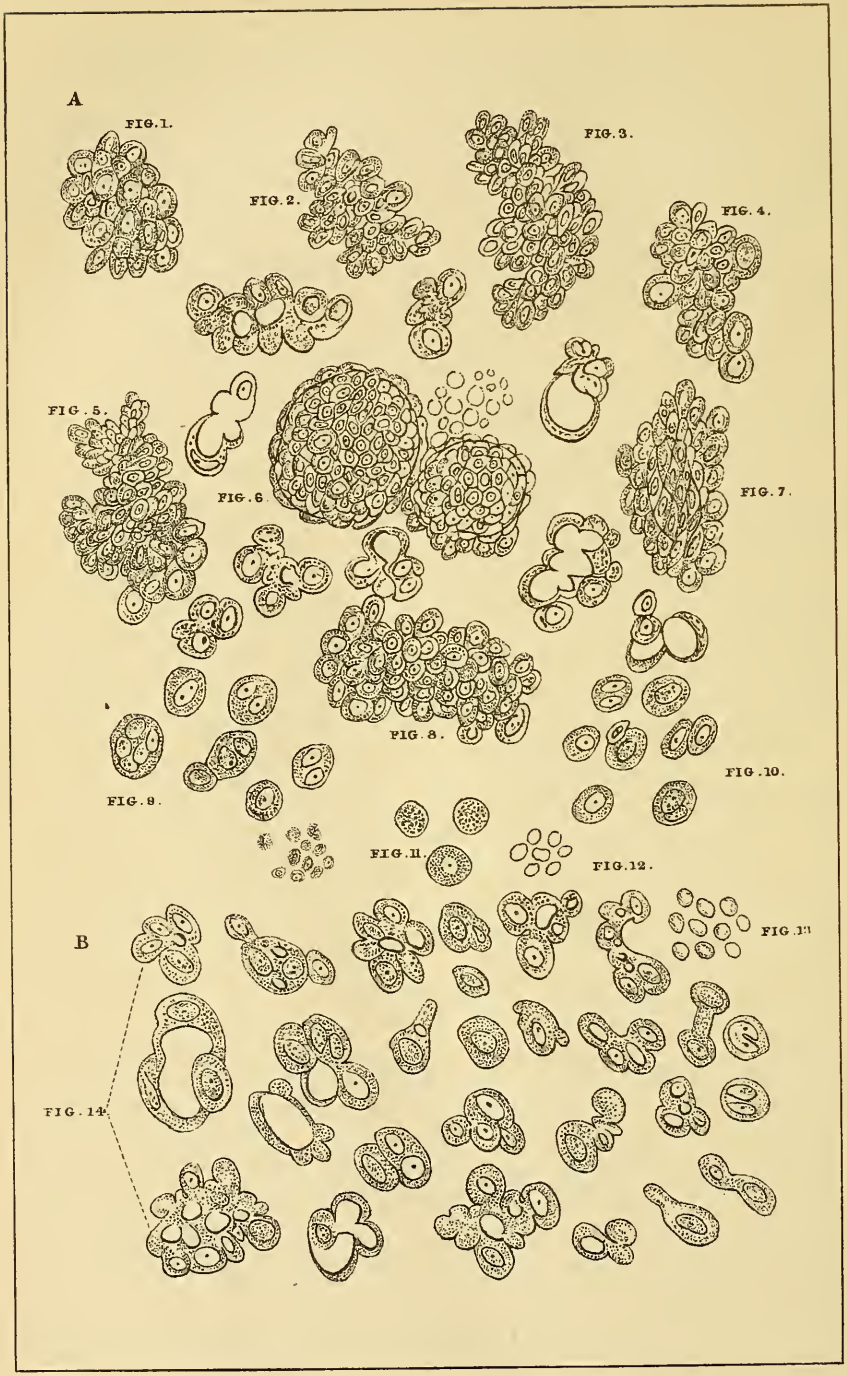
Fig. 128.

Section of ovary showing an epithelial tube (at the shaded part of the section). Lower down are seen spaces of varying size, and lined with a single layer of epithelium; these cysts are developed from the epithelial tubes. The connective tissue basis is shown only at the shaded part of section (De Sinéty).

according to him, these lymph corpuscles. Noeggerath considers that the cellular structures, which other observers hold to be Pflüger's ducts, are diseased vessels.

Waldeyer considers that ovarian tumours are developed from the processes of epithelium known as *Pflüger's ducts;* they arise, therefore, from the same source as the Graafian follicles.

De Sinéty and Malassez first described certain *epithelial tubes* from which ovarian tumours develop; these are not true Pflüger's ducts, but


A
FIG. 1.
FIG. 2.
FIG. 3.
FIG. 4.
FIG. 5.
FIG. 6
FIG. 7.
FIG. 8.
FIG. 9.
FIG. 10.
FIG. 11.
FIG. 12.
B
FIG. 13
FIG. 14.

differ from them in being hollow and having no ovum. They consider them as Pflüger's ducts which have taken on a low type of development (Fig. 128).

The student will therefore see that the cellular structures found on section of ovaries, although considered by all as a source of origin for ovarian cysts, have their nature disputed. Noeggerath believes them to be diseased blood-vessels; Waldeyer, Spiegelberg, and Schroeder consider them to be Pflüger's ducts; De Sinéty and Malassez hold that they are Pflüger's ducts degraded in development.

(*g.*) *Malignant Development of Connective Tissue of Ovary.*—In malignant disease of the ovary ascitic fluid is often formed in which are characteristic cells, first described by Dr. J. Foulis of Edinburgh. Plates VI. and VII. show these. They will be considered under the ascitic fluid associated with malignant tumours. Foulis' developmental work on the ovary has valuable bearings on its pathology.

At present more light is needed in ovarian pathology, as can readily be seen from the heterogeneous facts as yet at our disposal.

VARIETIES OF OVARIAN TUMOURS; THEIR NAKED-EYE AND MICROSCOPIC ANATOMY.

(1.) Hydrops folliculorum.
(2.) Cystoma ovarii—
  a. Cystoma ovarii proliferum glandulare.
  b. Cystoma ovarii proliferum papillare.
    (This is Waldeyer's classification. Rindfleisch speaks of a papillary form, a form caused by colloid degeneration of the ovarian stroma (Figs. 129, 130), and a form with cysto-colloid degeneration.)
(3.) Dermoid cysts.
(4.) Cystoma malignum.

Naked-eyed Anatomy.—We have the cysts and their pedicle. The cysts are always multiple; and the pedicle is usually made up of ovarian ligament, Fallopian tube, and broad ligament. Both cysts and pedicle are covered with peritoneum. On section of the cystoid tumour many cysts are found with papillary projections and inter-communications. The papillæ may coalesce and form retention or daughter-cysts. Microscopically we have already noted that in cases of hydrops folliculorum, where the size is that of a bean, the ovum has been found.

Microscopic Anatomy.—The wall of the cysts is made up of stratified connective tissue lined by columnar epithelium. In the *glandular* form (cystoma ovarii proliferum glandulare), the *epithelium* grows more outwards and forms occluded follicles in the cyst-wall; in these again other

Fig. 129.

Section through cyst-wall, showing papillæ covered with columnar epithelium and sub-epithelial layer of connective tissue (Rindfleisch) $^{200}/_{1}$.

follicles may develop. In the *papillary* form (cystoma ovarii proliferum papillare), the *connective tissue* of the cyst-wall sprouts out, pushing the lining of the cyst before it; these papillæ are covered with the columnar epithelium of the cyst.

Dermoid cysts are due to abnormal inclusion of the epiblast, *i.e.*, are developmental in their origin. They have an outer fibrous coat and an

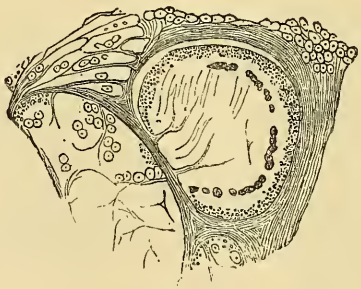


Fig. 130.

Colloid degeneration of ovarian stroma (Rindfleisch).

inner one composed of true skin. They may contain hair, teeth, bone, striped muscle, nervous matter, cholesterine, and sebaceous matter.

The *cystoma malignum* is a cystic tumour which has undergone malignant degeneration. It is noteworthy that malignant disease often develops after the removal of an apparently simple tumour.

THE NATURE OF OVARIAN FLUIDS AND OF PAROVARIAN FLUID.

Ovarian fluid varies much in consistence and color. It is usually viscid, and may be so thick as to be almost gelatinous. Its color is yellowish or greenish; and the specific gravity, when of the more fluid consistence, varies from 1010 to 1020. Chemically, the fluid is complex. Eichwald's results are those usually given.

"According to Eichwald the fluid contents of the cysts may be divided into two distinct classes of elements. The elements of the first class can always be distinguished from those of the second. On the other hand, the individual members of one class can only be separated from each other when one or more of the intermediate members are wanting.

"The two groups consist of the mucous matters and the albuminous matters. In the contents of large (old) colloid cysts the elements of the second class are apt to predominate, just as the elements of the mucous class do in the contents of the younger cysts.

"The first group is made up of the mucous elements, which are found to be variously modified. These are formed from the substance of the colloid bodies, and from the transformed parenchyma of the cells. From this mucine is formed, which, while not soluble in water, is found in the cysts in a hydrated condition. By a series of intermediate changes the mucine becomes gradually converted into the muco-peptone, which is very readily soluble in water, for mucine by degrees assumes the property of dissolving in water, and loses its peculiarity of being precipitated by acids. This substance, which, as we have seen, is produced by mucine changing into muco-peptone, and is therefore a sort of modified mucine, is the so-called colloid substance. This colloid degeneration is therefore nothing else than a mucous metamorphosis. The mucine group consists, therefore of:—

"1. Substance of the colloid corpuscles. Only soluble in diluted alcohol; perfectly precipitated by acetic acid.

"2. Mucine. Also soluble in alkaline earths, and becomes hydrated in water; perfectly precipitated by acetic acid.

"3. Colloid substance. Slightly soluble in cold, but more soluble in hot water. Becomes turbid on the addition of acetic acid, but does not form a perfect coagulum.

"4. Muco-peptone. Very easily soluble in water; not precipitated by acetic acid.

"The other class is the albuminous. The albumen is found in colloid ovarian cysts, under two forms, as free albumen and as albuminate of soda. The former coagulates by simply boiling; the latter only on the addition of an acid. The former, the free albumen, is always changed in colloid tumours into albumino-peptone, while the albuminate of soda remains unaltered. This change takes place very gradually. First, the property of coagulating on being heated is lost—it becomes paralbumen; then it loses by degrees the property of being precipitated by the mineral acids, and becomes a metalbumen. Paralbumen and metalbumen are, however, not fixed bodies, but their peculiarity consists in their gradual change from free albumen to peptone.

"The albuminous group consists of:—

"1. Albumen (fibrine);
"2. Paralbumen;
"3. Metalbumen;
"4. Albumino-peptone (fibro-peptone).

"The peculiarities of the several component parts are the same as those of the components of the mucine class. They are distinguished from the mucine class by the fact that they contain sulphur, and by their being precipitated by tannin and the neutral metallic salts. Since albumen gradually changes into peptone, a process takes place exactly like that of digestion.

"On boiling, the contents of the cysts will be found to vary according to the amount of free albumen present. The fluid is perfectly clear if all the free albumen remains unchanged, but on the addition of acid it always becomes turbid, inasmuch as it then invariably contains the albuminate of soda."—(*From Schroeder.*)

Ovarian fluid does not give a flocculent precipitate as ascitic fluid does.

The corpuscular elements of ovarian fluids are various. There may be oil-globules, cholesterine crystals, blood, fresh or altered, with large granular cells.

Hughes Bennett, of Edinburgh, and Drysdale, of Philadelphia, have described a corpuscle, seen at Fig. 131, as characteristic of ovarian fluids. According to Drysdale, it "is generally round, delicate, transparent, and contains a number of granules but no nucleus;" its size varies from $\frac{1}{500}$ of an inch to $\frac{1}{2000}$ of an inch in diameter. Acetic acid added to pus

makes the cells larger and brings nuclei into view; while it only increases the transparency of the ovarian cell and makes its granules more evident.

Fig. 131.

Some cellular elements of ovarian fluid. At the upper right-hand corner we have red blood-corpuscles. Below these lie the granular ovarian cells, and below them free granular matter.

At the upper left-hand corner is shown an epithelial cell; below it, a pus cell after addition of acetic acid; and below this, pus cells before addition of acetic acid (Drysdale).

Parovarian fluid is little more than a solution of salt, and to the naked eye is just like clear water. It contains no cellular elements.

SOLID OVARIAN TUMOURS; MALIGNANT TUMOURS AND THE NATURE OF THE ASCITIC FLUID ASSOCIATED WITH THEM.

Non-malignant (fibrous[1] and cartilaginous) tumours are rare. A tubercular condition of the ovary is found as part of general tuberculosis.

Malignant disease of the ovary is a comparatively frequent occurrence. It often complicates cystic degeneration, especially the papillary form of ovarian cyst. It arises also independently, and may occur either in the scirrhus or medullary form. The most important feature is the rapid development of ascites, without the existence of cardiac, hepatic, or renal disease to explain it. Of great importance are the cells in the ascitic fluid associated with malignant ovarian disease. Dr. Foulis of Edinburgh has investigated this subject, and has brought out results of very great value. Through his kindness we have been able to reproduce, in Plates VI. and VII., the cells he has drawn attention to; and he has kindly furnished us with the following description:—

[1] In London Obst. Trans., Vol. XX., p. 276, is an interesting case (with plate) reported by Cullingworth as fibroma of both ovaries. Each ovary was converted into a solid nodulated tumour—one the size of a fist, the other larger. There was no ascites. The microscopic examination gave suspicion of *commencing sarcoma*. The literature of fibroma ovarii is fully given in this paper.

"*A.* Sprouting cell groups found in ascitic fluid surrounding a large cysto-sarcoma of the ovary. (For a history of this case see Edin. Med. Jour., 1875, p. 838. In Figures 3, 4, 5, 7 great variation in form and size of the cells in each group is seen. The largest cells are generally seen at the margins of the groups. Fig. 9, several large polynucleated cells, evidently detached from cell groups. Fig. 11, cells undergoing fatty degeneration. Fig. 12, blood-corpuscles.)

"*B.* Cell groups found in the deposit from ascitic fluid surrounding a large, soft, malignant tumour of the ovary. In many of the cell-masses large vacuoles are seen.

"*C.* Cell groups found in the deposit from ascitic fluid surrounding a large flat, or pancake-shaped, tumour of the omentum. The tumour was thought to be ovarian. In the fluid in the pleural sacs exactly similar cells and cell groups were seen, and the pleural surface of the diaphragm was studded over with cancerous nodules.

"*D.* Cell groups found in ascitic fluid in the case of a gentleman, aged seventy, suffering from malignant peritonitis. In the centre a very large cell mass, with numerous vacuoles in the substance of the protoplasm, is seen.

"All the cell groups and cells were drawn by the aid of the camera lucida under a power of 350 diameters, with No. 3 ocular."

To illustrate the development of the normal ovary and of the Graafian follicles, we have added the following figures from Foulis' paper on this subject:—

"*E.* Section through ovary and Wolffian body of a fœtal lamb. (*a*, stalk of ovary; *STR*, stroma; *MD*, duct of Müller; *e*, epithelium of peritoneum; *g*, germ epithelium; *y*, deepest part of the parenchymatous zone of the ovary.)

"*F.* Connective tissue sprouting up and surrounding the germ epithelium."

It is probable that these liberated cells found in ascitic fluid graft themselves on the peritoneum, and pass through the diaphragm into the pleura and pericardium. They behave just as we have seen bacteria do (*vide* p. 162).

H. BENCKE, LITH. N.Y.

CHAPTER XXI.

DIAGNOSIS OF OVARIAN TUMOURS.

LITERATURE.

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For convenience we take up the diagnosis and differential diagnosis of ovarian tumours under two heads:—

A. When small, and pelvic in position;
B. When large, and chiefly abdominal in position.

A. WHEN SMALL, AND PELVIC IN POSITION.

They may be either (*a*) lateral to uterus, or (*b*) posterior to uterus.

(*a.*) *Pelvic Ovarian Tumours lateral to Uterus.*

1. *Symptoms.*—These are chiefly those of pressure and bearing down, and have no diagnostic value. There is no menorrhagia.

2. *Physical Signs.*—Palpation and percussion give evidence of the presence of a tumour only when it projects much above the brim. Auscultation gives negative results. On vaginal examination, the cervix is

found displaced to the side opposite to that where the tumour is. Through the fornix a tense, rounded, fluctuating mass is felt projecting downwards. Bimanually the uterus is felt not enlarged, but is displaced to the one side and is distinct from the tumour, which can be mapped out between the hands. Usually the uterus and tumour are not very movable, owing to the limited space of the pelvic cavity. When the tumour is tapped, ovarian fluid is got.

3. *Differential Diagnosis.*—When *lateral* to the uterus they require to be differentiated from the following:

(1.) Pelvic cellulitis;
(2.) Pelvic peritonitis (encysted serous effusions);
(3.) Parovarian cysts;
(4.) Hydrosalpinx, Pyosalpinx;
(5.) Fallopian tube gestation;
(6.) Fibroid and fibro-cystic tumours of uterus;
(7.) Blood effusion;
(8.) Solid ovarian tumours.

(1.) *Pelvic Cellulitis.*—With this we have inflammatory history and probable cause, as abortion or labour, to guide us. When the cellulitis has gone on to suppuration, there will be rigors and other indications of suppuration. Cellulitic deposits are almost always fixed; are firm when not purulent, and even when purulent do not give very distinct fluctuation.

(2.) *Pelvic Peritonitis.*—This will not cause the fornix to bulge downwards, and the history will help us. Tapping gives serum, and not ovarian fluid. When an ovarian tumour is fixed by peritonitic adhesions, it will be almost impossible to diagnose it from encysted pelvic peritonitic effusion except by examination of the fluid.

(3.) *Parovarian cysts* are not so rounded and have very distinct fluctuation; their secretion is simple salt and water, and when tapped they do not recur.

(4.) *Hydrosalpinx and pyosalpinx* are high in pelvis, tortuous, elongated from side to side.

(5.) *Fallopian tube gestation* (*v.* extra-uterine gestation under Section IX.).

(6.) *Fibroid and fibro-cystic tumours of uterus* (*v.* Section V.).

(7.) *Blood effusion* in the broad ligaments is difficult to diagnose during life, and is chiefly discovered on operation or post-mortem. The same is true of Hæmatometra.

(8.) *Solid ovarian tumours* are rare. When malignant there are often nodules in the fornices and ascitic fluid which shows the cells shown at Plates VI. and VII.

b. Pelvic Ovarian Tumours posterior to Uterus.

1. *Symptoms.*—The most striking one is associated with urination; there is either retention or constant desire to micturate. There is no menorrhagia.

2. *Physical Signs.*—Palpation, auscultation, and percussion give the same result as when the tumour is lateral. On bimanual examination, the uterus is felt markedly displaced to the front, but is not enlarged; and bulging downwards behind the cervix, the round globular cystic ovary can be grasped. Tapping gives ovarian fluid.

3. *Differential Diagnosis.*—When *posterior* to the uterus, they require to be differentiated from the following conditions.

(1.) Encysted serous peritonitic effusion,
(2.) Retro-uterine hæmatocele,
(3.) Fibroid and fibro-cystic tumours of the uterus,
(4.) Retroverted gravid uterus and extra-uterine fœtation,
(5.) Parovarian cysts.

(1.) *Peritonitic effusion* has an inflammatory history; it is not so rounded nor so well defined above. The fluid is serous.

(2.) *Retro-uterine hæmatocele* has, after the blood has coagulated, a hard feeling and is more expanded transversely. There is a history of sudden onset, menorrhagia, and subsequent inflammatory symptoms.

(3.) *Fibroid and fibro-cystic tumour of the uterus* (*v.* Section V.).

(4.) *Retroverted gravid uterus and extra uterine fœtation* (*v.* Section IX.).

(5.) *Parovarian Cysts.*—The character of the fluid is our only certain guide.

It should be specially noted that these pelvic ovarian tumours are apt to cause *pelvic inflammation* and thus render the exact diagnosis, unless aided by tapping, very difficult.

B. DIAGNOSIS OF OVARIAN TUMOURS WHEN LARGE, AND CHIEFLY ABDOMINAL IN POSITION.

1. *Symptoms*—These are chiefly due to its bulk. The patient's notice is attracted to the fact that she is getting rapidly stout. Recently, Jas-

trebow has alleged that the sensibility of that part of the groin supplied by the genito-crural nerve is impaired on the same side as that on which the tumour is.

2. *Physical Signs.*—When the patient lies on her back and the abdominal surface is bared, the following points can be noted.

On *inspection* the abdomen is seen to be greatly distended. The distention may be uniform, but is often more or less markedly lateral. The distance from the anterior superior spinous process to the umbilicus is greater on one side than the other. The superficial abdominal veins may be dilated, and lineæ albicantes are sometimes present.

On *palpation,* the distention is felt to be due to an encysted collection of fluid. A mass is felt in the abdominal cavity which is like a sac filled

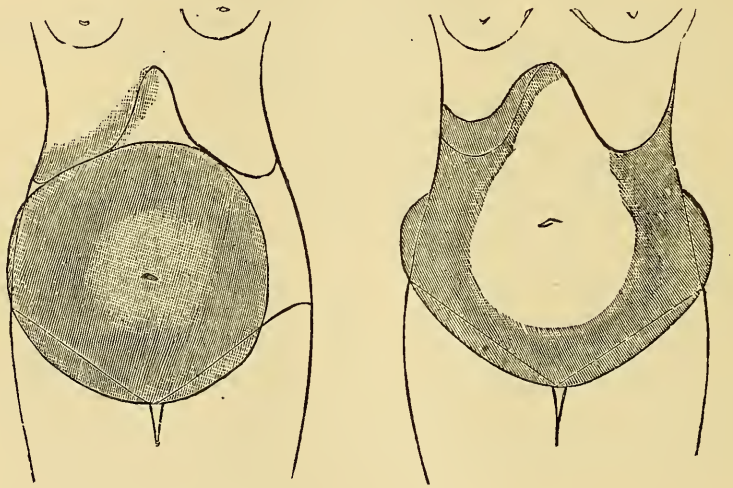

Fig. 132.

The shaded portion shows the dull area; left figure—ovarian tumour, right figure—ascites (Barnes).

with fluid. Fluctuation is got by placing one hand at a special part and tapping at an opposite point with the fingers of the other hand. However long the tumour be manipulated, *there is never felt any muscular contraction of the cyst-wall.*

On *percussion* when the patient lies dorsal, a dull note is obtained over the tumour (Fig. 132); but at the flank, where the tumour does not bulge, it is clear and tympanitic, since the intestines are there. When the patient turns on her side, with this flank uppermost, the dulness and

tympanitic note do not change in position. This sign shows we have to deal with an *encysted* collection of fluid.

Auscultation gives entirely negative results. No sound is heard unless that of friction over a localized peritonitis.

On *vaginal examination*, the uterus is felt displaced to one or other side, or very much to the front. It is rarely retroverted, and—unless impregnated—is not enlarged. The tumour does not usually bulge down into the fornices, but may be made out bimanually.

In order to ascertain how the pedicle lies, we have to make the examination *per rectum*. The tumour is drawn upwards in the abdominal cavity by an assistant. We now lay hold of the cervix with a volsella, pass the index finger of the right hand into the rectum, make traction on the cervix till the fundus is brought within reach of the rectal finger. We recognize a tense band passing from one angle of the fundus, and the enlarged ovarian artery may be felt pulsating in it. We now examine for the ovary of the opposite side; this is ascertained to be normal in size. The possibility of both ovaries being cystic (which would produce a pedicle on each side) should not be forgotten, though this is comparatively rare. The examination with the volsella is made easier by placing the patient *in the genu-pectoral posture;* the weight of the tumour makes it gravitate into the abdomen, and renders the pedicle tense; it is also easier to make the rectal examination in this position.

3. *Differential Diagnosis of Abdominal Ovarian Tumours.*

They must be diagnosed from the following conditions:—

(1.) Pregnancy and Hydramnios,
(2.) Fibroma uteri,
(3.) Ascitic fluid,
(4.) Fibrocystic tumours of the uterus,
(5.) Parovian tumours,
(6.) Encysted dropsy,
(7.) Thickened omentum enclosing intestines by adhesions,
(8.) Omental tumours,
(9.) Renal tumours,
(10.) Hydatid of liver,
(11.) Pseudocyesis,
(12.) Distended bladder.

In observing a case of abdominal tumour, the student makes first his positive examination systematically; he makes in every case what is called

the routine examination, noting what he observes. By this means he may get facts enough to warrant his drawing a distinct conclusion as to its nature. This, however, is not always the case; he has then to use diagnosis *by exclusion;* it must be one of a certain fixed number of things; the possibilities are excluded one by one till a definite diagnosis is reached.

We have stated above that ovarian tumours require to be diagnosed from twelve conditions. On each of these we make some brief remarks.

Pregnancy.—At the period of pregnancy, when the uterus is so enlarged as to be above the pelvic brim, certain conditions are present. These are suppression of menstruation for a given period, and size of the uterus corresponding to this; mammary signs; lineæ albicantes, and pigmentation. On palpation, we feel a tumour without distinct fluctuation and *having intermittent contractions;* the fœtus can be palpated out. The fœtal heart (after the fourth month) and the uterine souffle are heard. The vagina is dark in color, the mucous secretion increased, and the cervix soft.

We need hardly say that the palpation, the fœtal heart-sounds, bruit and vaginal changes mark out the pregnancy unmistakably. These points may seem too simple to require mention, but cases have been recorded where the pregnant uterus has been tapped for an ovarian cyst.

Hydramnios may simulate an ovarian cyst. The amenorrhœa will help, and especially the occurrence of intermittent contractions as Braxton Hicks has specially pointed out. In one of his recorded cases, the tumour was the size of a seven months' uterus with distinct fluctuation, and there was amenorrhœa for five months. Palpation gave the uterine hardening. Previous to this it had been tapped as a cystic ovarian tumour.

(2.) *Fibroma uteri* (*v.* Section V.).

(3.)—*Ascitic Fluid.*—When the patient lies on her back, percussion gives a tympanitic note at the umbilicus and a dull one at the flanks (Fig. 132); when on her left side, the note is dull on that side and clear over the right; when on her right, it is dull on that side and tympanitic on the left; when she sits up, the upper limit of the dulness is curved with the convexity downwards.

The reason of this is evident. The intestines float on the fluid at its highest point and give the tympanitic note accordingly (Fig. 132).

(4.) *Fibrocystic tumours of the uterus* are difficult to diagnose. The following points should be noted. Fluctuation is only partial, and the consistence is variable; the rate of growth is slower; and the fluid drawn off coagulates spontaneously. It is often difficult to separate these from

ovarian tumours, and the best operators have sometimes failed to do so (*v.* Section V.).

(5.) *Parovarian tumours* have very well-marked fluctuation, have their characteristic fluid, and when once tapped do not refill, as they are mere retention cysts.

(6, 7, and 8.) In many cases we can make out that the tumour does not pass down into the pelvis and is not connected with the uterus. Sometimes the case is obscure, and abdominal incision alone clears matters up.

(9.) *Renal tumours* grow downwards and inwards. When right-sided, the tympanitic colon lies between them and the liver. Their fluid contains urea.

(10.) The connection of the *hydatid* with the liver can be made out.

(11.) In *Pseudocyesis* the percussion note is tympanitic, and the swelling disappears under chloroform.

(12.) The *distended bladder* is of course emptied by the catheter.

DIAGNOSIS OF ADHESIONS.

When pelvic, the thickening they cause can be felt. Tappings are one great cause of adhesions; they may also arise from mere pressure. Careful inquiry should always be made as to the history. On palpating the tumour, one can often feel friction. On making the patient take a deep breath, it should be noted whether the abdominal walls move over the surface of the tumour. Much less importance is attached now-a-days to the existence of abdominal adhesions. When pelvic, especially if to the bladder or deep in the pouch of Douglas, they are more serious.

COEXISTENCE OF PREGNANCY AND OVARIAN TUMOUR.

It should be kept in mind that pregnancy may coexist with an ovarian tumour, giving its own special symptoms and physical signs in addition.

CHAPTER XXII.

OPERATIVE TREATMENT OF OVARIAN TUMOURS.

LITERATURE.

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Removal of the ovarian tumour by abdominal or vaginal section—in almost all cases abdominal—is the treatment now practised. Other methods have, however, been employed; a brief *résumé* of these will be useful to the student.

These methods have been tapping, tapping and injection of the cyst with iodine, electrolysis, drainage into the peritoneal cavity or through the vagina.

Tapping is not a method of treatment followed by cure, and should be used only when it is necessary to obtain fluid for diagnosis. It cures parovarian cysts, as these are mere retention cysts. Ovarian cysts are not retention cysts, but have a proliferating lining membrane, for which reason tapping does not cure them. An additional reason against tapping is that it is a procedure by no means free from danger, even to life. By

oozing of the fluid through the puncture, adhesions are set up ; in some cases, septic peritonitis has proved fatal. Tapping, further, is only palliative and must be followed by ovariotomy.

Method of Tapping.—See that the bladder is empty. With the patient lying on her back make an incision through skin and fat for about an inch, and midway between umbilicus and pubis. Then plunge in the trocar seen at Fig. 134. To the side-tube a long piece of tubing is attached, which dips under water. While the fluid is flowing, the patient lies on her side. No bandage is necessary. Care should be taken to prevent regurgitation of air, and a suitable dressing should be applied to the wound (*vide* under Ovariotomy).

Tapping and injection of the cyst with iodine is a procedure not now practised, owing to the risks and uncertainty attending it.

Electrolysis was at one time advocated as a means of cure. Its pretensions to this are unfounded, and no operator now practises it. Its use has been carefully considered by Mundé of New York in the article cited, which may be consulted for details and information.

Drainage into the Peritoneal Cavity or through the Vagina.—The former is dangerous, and the latter is only practised in those cases where the cyst is immovably fixed by adhesions.

One fact must be finally noted. Cases of cure of ovarian cysts by tapping, drainage, or electrolysis, are sometimes recorded. These cysts have probably not been ovarian, but cysts of the broad ligament—parovarian. Mere tapping often cures the latter. Electrolysis does the same. Electricity has nothing to do with it, the puncture of the needle is enough.

OVARIOTOMY.

This is performed by vaginal or by abdominal incision. The former is very rarely employed, the latter is the usual method.

VAGINAL METHOD.

This may be practised when the tumour is pelvic and small. Thomas of New York, Goodell of Philadelphia, Gilmore, Hamilton and others have recorded cases. The following is the plan of procedure :

Chloroform or etherize the patient. Place her semiprone or in the lithotomy posture. Pass the Sims speculum. Incise the posterior vaginal wall behind the cervix, in the middle line. Tap the tumour with

an aspirator, and then draw it through the incision with the finger or curved forceps. Ligature the pedicle with thin carbolized silk threaded on a handled needle, and divide it on the distal side. Pass a T-shaped drainage-tube into the wound, which may be stitched round it or left open. Should the temperature rise or the discharge become fetid, irrigate daily with weak carbolic lotion (1–100).

Encouraging results have been got by this method.

ABDOMINAL METHOD.

These questions are often asked: When is the best time to operate on an ovarian tumour? Should it be removed when small, or should the operator wait until it is of good size? If the latter, how large should it be?

It is better not to operate by this method when the tumour is small, but to wait until its size is that of a six months' or nine months' pregnancy. A tumour of this size has displaced the small intestine from its usual position behind the anterior abdominal wall, and has stretched and thinned out somewhat the latter. The abdominal incision is therefore more easily made and the intestines are out of harm's reach. Of course it should not be forgotten that, when the medical man is consulted, ovarian tumours have usually become abdominal and large.

Let us suppose, then, that the ovariotomist has a patient—who is otherwise healthy—with an ovarian tumour free from adhesions, and that her period has occurred ten days before. How is the operation performed?

If the patient has not been in any way confined to bed, it is probably better to delay the operation till another period has passed, in order to accustom her to an invalid's life. She is kept on light diet, and has no solid food for six hours previous to the administration of chloroform. On the evening prior to the operation, castor-oil should be given and an enema used in the morning.

The following are the requisites for operation:

Chloroform and ether;
Hypodermic syringe;
Spray;
Carbolic lotion;
Porcelain trays for instruments;
Sponges (a definite number), some small and fixed on sponge-holders;

Waterproof, with oval opening, of which the edges are coated with adhesive plaster;

Ordinary knives;

Probe-pointed curved bistoury;

Scissors, straight and curved;

Spatulæ;

Dissecting and dressing forceps;

Péan's or Wells' artery forceps—a definite number (20) of pairs;

Tenacula, blunt hooks;

Needles on fixed handles;

Aneurism needle;

Fine catgut for bleeding vessels;

Carbolised silk (Nos. 3 and 4);

Two pair ovariotomy forceps (Nélaton's or Keith's);

Wells' trocar;

Clamp (in reserve);

Cautery, actual or Paquelin's;

Cautery-clamp;

Long straight needles, threaded two on each suture of silkworm-gut;

Needle-holder with small needles on horse-hair sutures;

Drainage-tubes (glass or ordinary);

Carbolic gauze, protective silk, mackintosh, flannel bandages.

The assistants necessary are five or six in number, viz., one for chloroform, one for instruments, one to help the operator, one to look after the spray; and one for the cautery. A trained nurse who can pass the catheter and administer purgative or nutritive enemata, is necessary. The patient is placed on an ordinary table, of convenient height and length, and lies on her back. The table is placed so that the patient's feet are towards the window. The legs and chest are to be warmly covered, and hot-water bottles should be laid at her side and feet. The room should be comfortably warm. The best position for the operator is to stand on the patient's right side, with his back to her feet and to the window. The question of the use of antiseptics in ovariotomy will be discussed afterwards. The instruments are placed near the operator in shallow porcelain trays, and in 1–40 carbolic solution.

The sponges should be soft, fine, and thoroughly clean. Seven or

eight are sufficient. Some are small and on sponge-holders; one is large and flat. They should be thoroughly wrung out of warm 1–60 solution. *The sponge assistant should know how many sponges he has, and should be sure that he has recovered them all before the abdominal wound is closed. Sponges should never on any account be torn up during an operation.*

The spray, if used, should be placed eight or ten feet from the wound, and should throw out a finely divided vapour.

Preliminaries.—The patient, who has had a very light breakfast some hours previously, should be chloroformed; the skin washed and shaved; and the waterproof made to adhere to the skin, so that the incision shall bisect the portion exposed through the oval opening. This waterproof keeps the patient dry and comfortable.

The following are the steps of an ordinary operation:—

1. The abdominal incision;
2. Evacuation of the cyst contents;
3. Drawing out of the cyst from the abdomen;
4. Its separation at the pedicle;
5. Treatment of adhesions, and bleeding from them;
6. The peritoneal toilette;
7. Closure of the abdominal wound;
8. Drainage—when necessary;
9. Dressing of the wound;
10. After-treatment—complications.

1. *The Abdominal Incision.*—This is usually four or five inches long, is made in the middle line, and has its lower limit about an inch above the symphysis. It passes through—

skin,
fat,
linea alba,
fascia transversalis,
extraperitoneal fat,
peritoneum.

Sometimes the linea alba is missed, and the rectus muscle cut into. By passing a probe in towards the middle line, the operator gets the right track and thus avoids bleeding. The extraperitoneal fat is a good landmark. All bleeding points are carefully attended to before the peritoneum is opened. They may be seized with Péan's forceps, which are left on for a time, or they may be ligatured with catgut. When the

smooth shining peritoneum is reached, it should be hooked up with a fine tenaculum and cut into. The cyst-wall is now exposed.

2. *Evacuation of the Cyst Contents.*—This may be accomplished in various ways. Wells' trocar (Fig. 133), with its point projected, is plunged

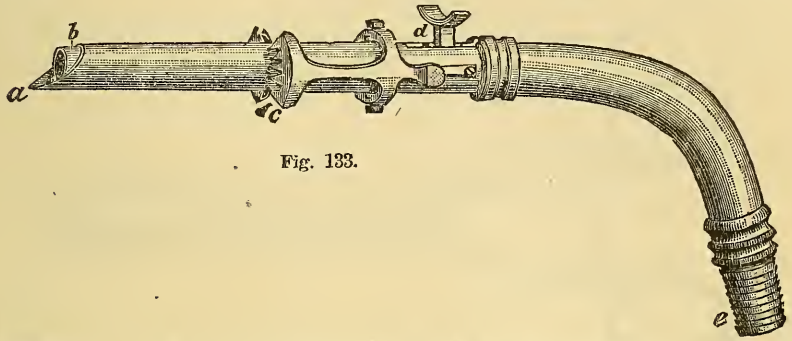

Fig. 133.

Wells' Trocar (⅓). *a*, sharp point, protected by tube *b*, which is projected by pushing out thumb-piece *d*; *c*, toothed catch to grasp cyst-wall; gutta-percha tubing is fitted on to *e*.

in, and the fluid passes along the thick tube to a suitable pail below the table. As soon as the trocar enters the cyst, the shield is pushed out to guard the point. The trocar has teeth for catching up the cyst-wall. Keith uses a large aspirator, so as to empty speedily. Schroeder uses no trocar, but simply cuts in with his knife and squeezes the fluid out. The kneed trocar may be used (Fig. 134). When the fluid is very thick it may

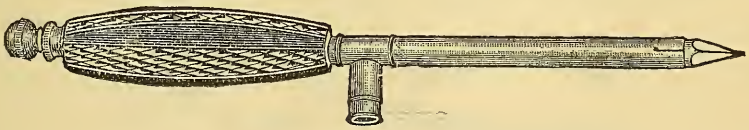

Fig. 134.

Trocar for tapping. Tubing is fitted to side piece.

not flow, and have to be squeezed or scooped out. Secondary cysts, if large, are also perforated.

While the fluid is being evacuated an assistant keeps up steady pressure on the abdominal walls, in order to prevent the intestines from passing out.

3. *Drawing out of the Cyst from the Abdomen.*—This is accomplished by seizing the collapsed walls of the tumour with Nélaton's (Fig. 135) or Keith's forceps, and steadily pulling it out. The assistant still keeps up pressure. By this means, the operator now has the pedicle at the abdominal incision, and the cyst outside.

4. *Its Separation at the Pedicle.*—This is one of the most important steps of the operation. There are three methods which may be used, *viz.*—

The clamp,
The cautery,
The ligature.

Of these, the clamp is now seldom used. Keith and others advocate

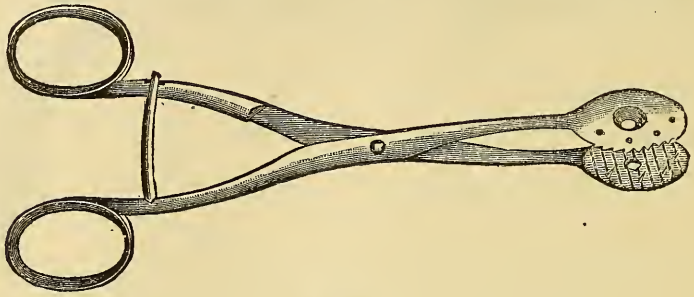

Fig. 135.
Nélaton's forceps.

the cautery; but the ligature and dropping back of the pedicle is the favourite and probably the best method.

The clamp was introduced by Jonathan Hutchinson, but, as already said, is now yielding to the ligature. The varieties of clamp are numerous. Fig. 136 shows Wells'; it consists of two short arms jointed to-

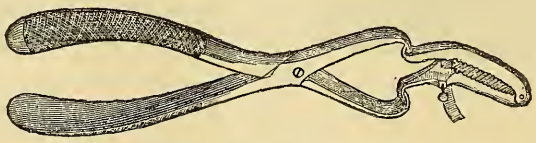

Fig. 136.
Wells' clamp (⅓), with removable handles. The serrated part with the screw is the clamp proper.

gether and provided with a screw and removable handles. It is used as follows:

The clamp is held by its handles and made to grasp the pedicle between the cyst and the uterus; the bars of the clamp proper are then approximated, and the screw tightly screwed up. The pedicle is examined to see that it is grasped and equally compressed; if one part is thin, Spencer Wells recommends that the pedicle be first secured with a ligature. The pedicle is treated extra-peritoneally with the clamp which rests on the skin. The great advantage of the clamp is its security

against hemorrhage. Its evident disadvantages are the following: it does not suit all cases, as it cannot be used when the pedicle is too large or too short; it may cause ventral hernia; it exercises undue traction on the uterus; but, above all, it may cause a slough deeper down than the skin, and the discharges, passing into the peritoneal cavity, may do great mischief.

The cautery was introduced, as a means of treating the pedicle, by Baker Brown of London. It gives better results than the clamp.

In order to use the cautery, we need a special cautery-clamp and either cautery irons or Paquelin's cautery. Keith uses ordinary cautery irons heated in a little charcoal brazier. The *cautery-clamp* has two hinged bars provided with handles; each bar has one surface which is made of ivory—a non-conductor—and is placed next the skin; the other surface is made of metal; one of the bars has on its metal surface a metal upright running the whole length of the bar. The pedicle is seized with the clamp (ivory side next to the skin), and the screw turned to fix it. Then the cyst is cut off, so as to leave about an inch of the pedicle on the metal side. The dull cautery iron, which is hatchet-shaped, is then passed firmly over the surface, in the angle between the horizontal bar and the upright, until the pedicle is seared flush with the clamp. The pedicle is now caught at the under surface of the clamp with two pairs of forceps, and the clamp removed. If all is right, it is dropped into the abdomen after the peritoneal toilette is finished.

The ligature should be thin carbolised Chinese silk, No. 3 or 4. It is used in the following way:

A double silk ligature is threaded on a *blunt* needle. The pedicle is transfixed with this, and the ligature cut. Thus we have two ligatures through the pedicle; one is passed round the one half of the pedicle, the other round the other half. They may be made to interlace first so as to make a figure of eight. Each is tied firmly in a reef knot. The pedicle is then seized with Péan's forceps, one on each side just below the ligature; the cyst is clipped off about half an inch on the cyst side of the ligature; as the pedicle is still held up by the forceps it can be carefully examined to see if any bleeding occurs. It should be noted whether the ligature splits the pedicle vertically so as to cause bleeding; if so, the ends of the thread can be made to surround the whole pedicle below this. If there is no bleeding, the ligature is cut short and the pedicle dropped into the pelvis.

The raw end of the pedicle may be stitched with catgut to the broad ligament, so as to prevent its adhering to and constricting intestine (Thornton).

When the pedicle is thick and fleshy it may require to be tied in three portions as follows :—Pass a double thread so that its shorter half will embrace only *one-third* of the pedicle ; withdraw the needle, but keep it still running on the thread, and use it to carry the longer half of the thread through at a second point, so as to embrace the *middle third* of the pedicle ; one portion of the longer half thus forms a loop round the middle third, while the other portion embraces the *other third* of the pedicle.

After the pedicle has been secured by one of these methods, the other ovary should be examined, and if cystic removed also.

The distal portion of the pedicle does not slough ; according to Thornton we may have the five following results.

(1.) Adhesion of the peritoneal surfaces on opposite sides of the ligature, and absorption of ligature.

(2.) Lymph effused over ligature and end of stump, formation of new vessels.

(3.) Adhesion of pedicle raw surface to some neighbouring peritoneal surface and passage of blood-vessels between.

(4.) Hemorrhage from pampiniform plexus at outer edge.

(5.) No change or sloughing if patient dies soon.

5. *Treatment of Adhesions and Bleeding.*—The adhesions, in certain cases, may give a great deal of trouble. They may be at any point of the periphery of the tumour. When close to important viscera—especially the bladder, intestine, or liver—they are serious. Their treatment is best considered as follows : (*a*) when short, (*b*) when long.

(*a.*) When they are *short* and connected with the anterior abdominal wall, the cyst is sometimes cut into. The operator then separates the cyst from the wall, by passing his finger in between them where the adhesion ceases ; or he may evert the abdominal wall, and strip the cyst off it with dissecting forceps. Spencer Wells recommends in bad cases to evacuate the cyst, and then, by seizing the posterior wall of the cyst with a hand passed into the interior, to evert it and afterwards separate the adhesions. Pressure or the ligature will arrest any bleeding, or the cautery may be applied. If the bleeding is intractable, a good plan is to pinch up the abdominal walls at the bleeding part and pass a long, straight

needle through this fold, so as to keep the bleeding peritoneal surfaces in apposition.

(*b.*) When the adhesions are *long*, they may be ligatured at two points close to the cyst and divided between these.

When adhesions to the bladder are present great care must be taken, as, in separating them, the bladder may be torn into. If this happens, the tear should be stitched with fine catgut, and a catheter kept in for some days. (*Vide* under vesico-vaginal fistula.) When adhesions are inseparable, the adherent portion of the cyst may be ligatured all round with silk and then cut beyond the ligatures; or it may be simply cut all round the adherent portion, and the edges then cauterized.

For reflecting light into the pelvis or other deep parts, an ophthalmoscopic mirror is invaluable.

6. *The Peritoneal Toilette.*—This term is a convenient one used by German operators to indicate the *cleansing of the peritoneum.* It must be laid down as a cardinal principle in abdominal section that no serum or blood is to be left in the abdomen. The peritoneum should be thoroughly dry, and no oozing points are to be left. The importance of the toilette cannot be too strongly insisted on. Keith of Edinburgh, whose success in ovariotomy is unrivalled, takes the greatest care in this matter and attributes his success to it. Sims indeed says, "But I think now that it matters very little what we do with the pedicle, whether we use the clamp, the cautery, or the ligature, provided we take every care against the exudation of bloody serum into the peritoneal cavity after the closure of the abdominal wound."

7. *Closure of the Abdominal Wound.*—This is done as described in Battey's operation (p. 206).

8. *Drainage.*—As to drainage, the rule is that none is needed in simple cases; in cases of many adhesions, however, a glass drainage-tube should be passed in at the lower angle of the wound and down into the pelvis. This rule may seem to the student to clash with the invaluable principle that every wound from which there will be discharge ought to be drained. In ovariotomy, however, the peritoneum is an absorbent sac, and the discharge, after a simple operation, is absorbed *before it has time to putrefy* (Lister). In complicated cases, this drainage by absorption is insufficient; it becomes also dangerous from the amount of serum thrown out, and the risk of its putrefying. *External drainage* is, in such cases, imperative.

9. *Dressing of the Wound.*—This should be as follows: a piece of protective silk over the wound, over this two ply of carbolic gauze wrung out of 1–40 lotion, then an eight-ply dressing of dry gauze with mackintosh, and finally padding of salicylic wool; all is secured by a broad flannel bandage. If the pulse and temperature do not rise and there is no uneasiness, this may be left untouched—in simple cases—for eight or nine days. If there is discharge, the dressing should be changed when it soaks through.

10. *After-treatment: Treatment of Complications.*—Morphia may be given hypodermically, but only when necessary (*vide* p. 179). Little food is allowed for the first thirty-six hours. Hot water should be given *ad libitum*, as it helps flatus. At the end of this time, milk and beef-tea are added. An enema may be administered on the third or fourth day.

Complications may be—Secondary hemorrhage;
High temperature;
Septicæmia.

Secondary hemorrhage, if from the pedicle or adhesions, must be treated by the reopening of the wound and application of ligatures.

For high temperatures, the ice-cap is good. The Americans recommend the more wholesale method of reduction of temperature by Kibbee's ice-cot. Krohne & Seseman of London supply very convenient ice-caps made of block-tin pipe. Quinine in fifteen-grain doses tried. It is probable that some high temperatures, recorded by ovariotomists, have been due to the absorption by the peritoneum of carbolic acid used in Listerism.

In cases of septicæmia with peritonitis where, drainage has been employed, the peritoneal cavity should be washed with very weak carbolic lotion whenever there seems to be any tension or accumulation of putrid fluid; the abdominal incision may require to be re-opened for this purpose. The condition should be further treated by iron and stimulants as needed. (*Vide* treatment of pelvic peritonitis.)

THE RELATION OF LISTERISM TO OVARIOTOMY.

The Listerian method of treating wounds is based on the now generally accepted theory that the germ-laden air, coming in contact with a wound, leads to putrefactive changes which may end in septicæmia. Lister found carbolic acid destructive to the activity of these germs; and, consequently,

Listerism requires that the air in contact with the wound and all else that touches it, must be purified either with the spray or lotion. Listerism is in no sense a treatment of wounds, but is a *treatment of wound-surroundings*. The application of carbolic lotion to a wound is a necessary evil, as carbolic acid is an irritant and may be absorbed. In the cases treated by the surgeon, Listerism is of the greatest value ; and, with drainage, has worked the most mighty revolution in surgery. In peritoneal operations, however, its good is marred by the fact that the peritoneum absorbs the carbolic lotion, and thus its surface is irritated and often toxic effects ensue. Keith, Tait, and Bantock have therefore abandoned Listerism in abdominal surgery ; but Wells and Thornton still carry it strictly out. It is evident that ovariotomists must find some method which, while locally purifying the air, will yet be innocuous to the wound surface.

Practically most ovariotomists at present trust to modified Listerism, and to drainage when necessary. All Listerian precautions should be used except the spray.

OVARIOTOMY BY ENUCLEATION.

This is a method of ovariotomy introduced by Miner of Buffalo. According to him the pedicle divides into three or four bands containing blood-vessels gradually diminishing in the peritoneal investment of the cyst. The peritoneal covering of the cyst can be slit open and can be readily separated by the finger. The vessels in the tissue between the peritoneum and cyst are capillary and do not bleed. In this way the tumour is enucleated, and the artificial stalk—*i.e.*, peritoneum and pedicle —of tumour either left or treated by ligature, cautery, or clamp. This method is good when the tumour is irremovable by adhesions.

OVARIOTOMY WHEN PREGNANCY IS PRESENT.

Although pregnancy coexists with a large ovarian tumour, ovariotomy should still be performed. In the paper of Spencer Wells quoted he gives a table of nine cases where the pregnancy varied from the third to the seventh month, with the following results. Only one mother died : the pregnancy went on to full time in five of the cases ; in three the child was expelled prematurely, and in one the child was removed at the same time. The question of the treatment of a labour complicated with an ovarian tumour concerns the obstetrician rather than the gynecologist.

CONTRA-INDICATIONS TO OVARIOTOMY.

These are, universal adhesions and malignant disease. Ordinary ascites, kidney disease, or heart disease are not contra-indications unless far advanced. Prognosis should be careful in these cases.

COURSE AND RESULTS OF OVARIAN TUMOURS WHEN LEFT ALONE.

Adhesions may be set up as the result of chronic peritonitis arising from pressure and tapping. Occasionally the cyst bursts, and in the case of the ordinary ovarian tumour we may get rapid death. When parovarian tumours burst, the fluid is unirritating and is absorbed by the peritoneum, the patient thus becoming cured. Mathews Duncan and others have recorded cases of burst ovarian tumour rapidly becoming fatal.

Torsion of the pedicle to a slight extent is often noticed in ovarian tumours. When the torsion is so great as to cut off the blood-supply from the cyst, we get gangrene of the tumour, and in some cases very serious symptoms; *viz.*, peritonitis, vomiting, and severe abdominal pains. Dr. Wiltshire, of London, was the first to operate for this condition, and recently Lawson Tait has operated successfully in three cases. His papers should be consulted for details. It is interesting to note that the tumours so rotated are usually right-sided and not necessarily ovarian. The usual explanation of the rotation is that it is caused gradually by the fæcal contents passing down the rectum.

The course and results of ovarian tumours when left alone can fortunately not now be studied. The picture of ovarian disease running its course unchecked, so eloquently pictured by West, is happily now almost unknown.

"We have symptoms of the same kind as we see towards the close of every lingering disease, betokening the gradual failure, first of one power, then of another; the flickering of the taper, which, as all can see, must soon go out. The appetite becomes more and more capricious, and at last no ingenuity of culinary skill can tempt it, while digestion fails even more rapidly, and the wasting body tells but too plainly how the little food nourishes still less and less. The pulse grows feebler, and the strength diminishes every day, and one by one each customary exertion is abandoned. At first the efforts made for the sake of the change which the sick so crave for are given up; then those for cleanliness; and lastly, those for comfort—till at length one position is maintained all day long in spite

of the cracking of the tender skin, it sufficing for the patient that respiration can go on quietly, and she can suffer undisturbed. Weariness drives away sleep, or sleep brings no refreshing. The mind alone, amid the general decay, remains undisturbed; but it is not cheered by those illusory hopes which gild, though with a false brightness, the decline of the consumptive; for step by step death is felt to be advancing; the patient watches his approaches as keenly as we, often with acuter perception of his nearness. We come to the sick chamber day by day to be idle spectators of a sad ceremony, and leave it humbled by the consciousness of the narrow limits which circumscribe the resources of our art." (Quoted by Spencer Wells.)

At present, ovariotomy is one of the most successful of operations. Most ovariotomists have now a mortality of about 13 to 15 per cent., while in the hands of Keith of Edinburgh it has sunk to 10 per cent. Keith indeed has had 76 consecutive cases without a death.

SECTION V.

AFFECTIONS OF THE UTERUS.

There are three periods during which morbid conditions of the uterus arise.

1. The period of evolution or development—from the ovum up to puberty. During this stage they appear as anomalies in development in utero or during childhood. They produce no marked symptoms, but a recognition of their existence is important as regards the future history of the patient.

2. The period of physiological activity—from puberty to the menopause. During this stage there occur in the uterus the morbid processes of acute and chronic inflammation, and of new formation or tumour growth; on account of its mobility, the uterus is also liable to various forms of displacement. These pathological processes give rise to symptoms of themselves, and also from their effect on the normal functions of the uterus—menstruation, conception, and pregnancy. During parturition the cervix uteri is frequently lacerated, and this constitutes an important pathological condition.

3. The period of senile involution or retrogressive development—from the menopause to death. The term involution is generally used in the restricted sense of the process which occurs after childbirth, but it is the only one which conveniently expresses the retrogressive changes after physiological activity has ceased. During this stage the most important pathological process is that of malignant new formation.

Accordingly this section of the subject falls into chapters as follows:—

Chapter XXIII. Malformations of the Uterus.
" XXIV. Atresia and Stenosis of the Cervix Uteri.
" XXV. Atrophy of the Cervix and Uterus; Superinvolution.
" XXVI. Hypertrophy of the Cervix; Amputation.

CHAPTER XXVII. Laceration of the Cervix.
" XXVIII. Chronic Cervical Catarrh.
" XXIX. Endometritis.
" XXX. Metritis, Acute and Chronic; Subinvolution.
" XXXI. Displacements of the Uterus; Anteflexion; Anteversion; Retroversion; Retroflexion.
" XXXII. Inversion of the Uterus.
" XXXIII. Fibroid Tumour of the Uterus; Pathology and Etiology.
" XXXIV. Fibroid Tumour of the Uterus; Symptoms and Diagnosis.
" XXXV. Fibroid Tumour of the Uterus; Treatment.
" XXXVI. Fibrocystic Tumour of the Uterus.
" XXXVII. Polypi of the Uterus.
" XXXVIII. Carcinoma Uteri (of Cervix); Pathology and Etiology.
" XXXIX. Carcinoma Uteri (of Cervix); Symptoms and Diagnosis.
" XL. Carcinoma Uteri (of Cervix); Treatment.
" XLI. Carcinoma Uteri (of Body).
" XLII. Sarcoma Uteri.

CHAPTER XXIII.

MALFORMATIONS OF THE UTERUS.

LITERATURE.

Barnes—Op. cit., p. 462. *Churchill*—Obst. Journal of Great Britain, 1873, p. 256. *Kussmaul*—Von dem Mangel, der Verkümmerung und Verdoppelung der Gebärmutter, etc.: Wurzburg, 1859. *Mayerhofer*—Die Entwickelungsfehler der Gebärmutter: Billroth's Handbuch für Frauenkrankheiten, Stuttgart, 1878. *Schroeder*—Op. cit., S. 33.—*Simpson, A. R.*—Ed. Med. Jour., 1863, p. 957. *Turner*—Edin. Med. Jour., June, 1865, and May, 1866. The standard work is that of Kussmaul. The literature is given most fully by Mayerhofer.

What is usually described as "a malformation" is really a non-formation of one part, involving a relative disproportion. Of this we have an illustration in the uterus. The one-horned uterus is not a "malformation," if by this term we mean that the part which is present is maldeveloped; the condition is a result of the *non*-formation of the other horn and intervening fundus. It is misleading also to speak of a "double uterus;" the condition thus described is really a halved uterus, in which the halves have not united into the whole. The word, as used, therefore means an incomplete *result*, not a defective process. *Mal*-development is a contradiction in terms, there can only be *arrested* developments.

Malformations must be studied in connection with the normal development of the organ. In this way they become at once intelligible. There are two processes in the progression of an organ to its mature form—*development* and *growth*. There are therefore two causes which together operate in producing malformations—arrested development and arrested growth. The period of development of the uterus, by which we mean formation of parts, extends up to the twentieth week; the period of growth is much longer, and extends to the twentieth year (Arnold).

The student should not pass over this section of the subject as of little importance. To the practical man, malformations seem of little value because he has no power of modifying the result. To the scientific

man they are, however, of the greatest interest as furnishing him with permanent impressions of the transient states of development; they are development caught in the act and fixed permanently for after-investigation. In this chapter we recommend the student to read Etiology before Pathology.

PATHOLOGY.

Complete absence of the uterus is an extremely rare occurrence, and cannot be demonstrated except on post-mortem examination. It has been

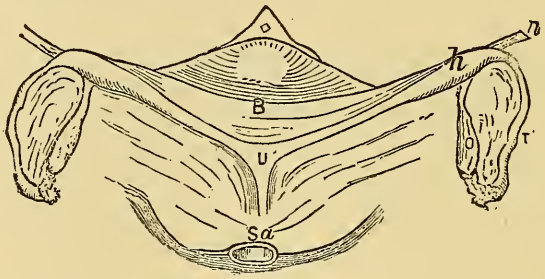

Fig. 137.

Rudimentary uterus (Veit). *Sa*, sacrum; *U*, solid rudiment of uterus; *h*, rudimentary horn; *B*, bladder; *O*, ovary; *T*, Fallopian tube; *r*, round ligament.

described only in cases of fœtal monstrosities. A *rudimentary condition* sometimes occurs; in this the uterus is represented by a band of muscu-

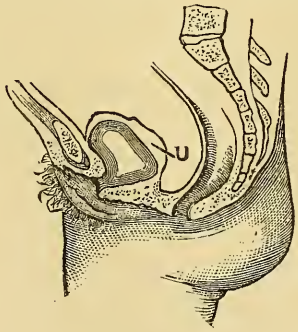

Fig. 138.

The same in its relation to the pelvic organs. *U*, rudiment of uterus on the posterior wall of bladder. The peritoneum forms one pouch between bladder and rectum (Schroeder).

lar fibre and connective tissue on the posterior wall of the bladder (Fig. 137), and the peritoneum forms a single pouch between the bladder and the rectum (Fig. 138).

In the *uterus bipartitus* (Fig. 139), rudimentary horns are present and are solid or hollow. The cervix is represented by a fibrous band which connects the horns with one another and with a rudimentary vagina. The

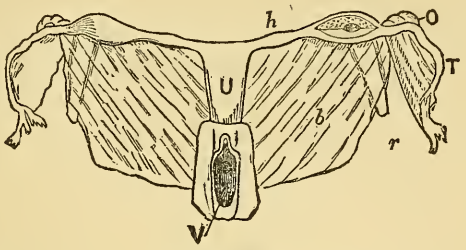

Fig. 139.

Uterus bipartitus (Rokitansky). *V*, vagina; *U*, uterus; *h*, rudimentary horn; *O*, ovary; *T*, tube; *r*, round ligament; *b*, broad ligament.

ovaries are sometimes well developed so that ovulation takes place. The breasts and external genitals may be fully formed.

The uterus unicornis (Fig. 140) may exist with or without a rudimentary second horn. The vaginal portion of the cervix is small; the palmæ plicatæ within the cervical canal are most marked towards the non-developed side. The body of the uterus is of disproportionate length and

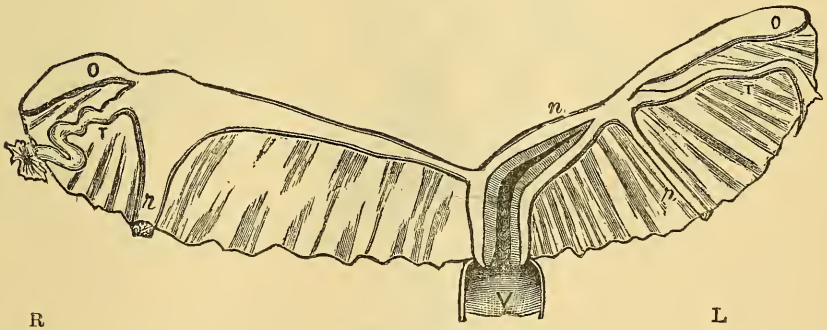

Fig. 140.

Uterus unicornis (Schroeder). *R*, right side; *L*, left side. The left horn (*h*) is well developed and communicates with the uterine cavity. The right horn is in the form of an elongated band; its point of connection with the Fallopian tube is indicated by the insertion of the round ligament, which is hypertrophied. Other letters as in preceding diagrams.

curves towards one side. The fundus, by which we understand the fully developed horn, is small and tapering; it has only one Fallopian tube and ovary connected with it. On the convex side of the somewhat curved body, is the representative of the other horn, which is either solid or hollow; it is connected with the developed one by fibrous tissue,

which may or may not form a pervious canal. Connected with this rudimentary horn are the Fallopian tube and ovary of the same side, which are sometimes perfectly developed. In examining preparations of this and other uterine malformations, it is sometimes difficult to determine what is rudimentary horn and what is Fallopian tube. Here development furnishes us with a guide. The insertion of the round ligament indicates the point up to which the ducts of Müller are to be formed first into uterine horn and then into fundus uteri. Accordingly, on examining such preparations we determine the point of *attachment of the round ligament;* all below this is uterine horn, all above it is Fallopian tube. Associated with this malformation we sometimes find absence or rudimentary condition of the kidney of the same side, since the development of the renal is closely connected with that of the generative system.

In the *uterus didelphys* the two halves of the uterus remain separate throughout their course. It is a very rare condition in the living adult female, and has been usually described in fœtal monstrosities. The vagina may be absent, single, or double.

By *uterus bicornis* we understand that the separation into two horns is

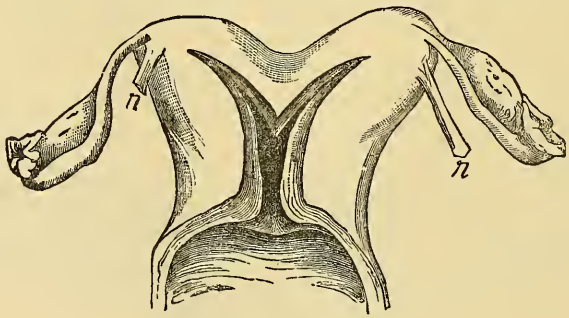

Fig. 141.

Uterus bicornis unicollis (Schroeder). *r*, round ligament.

distinctly visible *externally*. Of this there are various degrees, from a mere depression at the middle of the fundus to a well-marked bifurcation which rarely extends lower than the os internum; the farther down the separation extends, the more obtuse is the angle between the divergent horns. In addition to this external division, the separation is usually carried farther down by an internal septum which may extend to the os externum.

In the *uterus septus* (Fig. 142) there is no external indication of the in-

ternal division. The uterus is divided by a septum beginning at the fundus uteri and extending downwards for varying distances, sometimes as far as the os externum. It is otherwise normal.

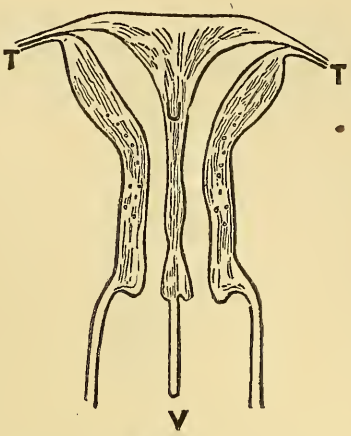

Fig. 142.

Uterus septus in vertical transverse section (Kussmaul). *U* (Uterus), placed on septum which divides cavity into two lateral portions; *T*, Fallopian tubes; *V*, vagina divided into lateral cavities by prolongation of septum downwards.

The *infantile uterus* (Fig. 143) is characterized by shortness of body and disproportionate length of cervix; in fact the relative lengths of body and cervix remain the same as at birth, from which the name "*infantile*"

Fig. 143.

Infantile uterus (Schroeder).

is derived. The cervix (1½ inch long) is two or even three times the length of the body (½ inch to ¾ inch). The whole uterus is smaller than the normal. The walls (especially those of the body) are thin and the cavity is small.

The term *congenital atrophy* is applied to cases in which the propor-

tions of body and cervix are of the normal *virgin* type, while the organ as a whole is atrophied (Fig. 144). An excess of connective tissue is present in the walls, which makes their consistence firmer. This malformation

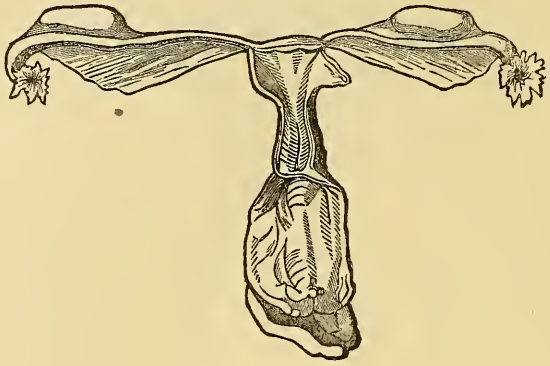

Fig. 144.

Primary atrophy of the uterus (Virchow).

occurs in scrofulous and chlorotic patients, and is often associated with hysteria and epilepsy.

ETIOLOGY AND CLASSIFICATION.

Malformations differ according to the period at which development and growth are arrested, and the extent to which they are interfered with. There are five periods in development and growth (Fürst), which can be easily remembered when we bear in mind the division of the period of intra-uterine life into ten *lunar months.* In the first period, which extends over the *first* and *second* lunar months (from fertilization to the eighth week), the septum between the adjacent ducts of Müller is as yet unbroken. By the end of the second period, which corresponds to the *third* month (*i.e.*, eighth to twelfth week), the septum has entirely disappeared ; but the upper portions of the ducts remain distinctly separate, forming the horns of the uterus and the Fallopian tubes. During the third period, *fourth* and *fifth* months, the angle between the uterine horns disappears so that the base of the uterus becomes flat. In the fourth period, *last five months*, the flattened end of the uterus, between the Fallopian tubes, becomes arched through the development of the fundus. The fifth period extends from *birth to puberty.* During this period no important change takes place till, at puberty, the uterus passes from the

infantile to the virgin form. It does not, however, cease to grow till the twentieth year.

We are not yet in a position to refer each malformation in detail to its proper period; but the more perfectly we are able to do this the more satisfactory will our classification be. At present we separate the first four periods from the fifth, and speak of the period of fœtal life in contra-distinction to the period of childhood. This forms the basis of our classification.

1. Malformations arising during Fœtal Life.—Of these there are the following: *complete absence* or *rudimentary condition* of the uterus; the *uterus bipartitus*, produced by a development of only the upper parts of the ducts of Müller into rudimentary horns of the uterus and Fallopian tubes; the *uterus unicornis*, due to the development of only one duct; the *uterus didelphys*, due to the development of the ducts separately, without coalescence; the *uterus bicornis*, in which the ducts coalesce below, and the horns remain ununited by a fundus above; the *uterus septus*, in which the coalescence of the ducts and development of the fundus take place, so that the uterus appears normal externally while internally the septum has persisted.

2. Malformations arising during Childhood.—Of these there are the following: the *uterus infantilis*, in which the uterus does not undergo the development which should take place at puberty but remains of the same type as it was at birth; *congenital atrophy* of the uterus, in which it assumes the virgin type, but the organ as a whole is atrophied.

SYMPTOMS.

The symptoms of malformation consist in an *impairment of function*, and hence do not appear until puberty.

In the external appearance of the patient there is not necessarily anything to attract attention. The figure, features, temperament, and voice are of the feminine type, even though the uterus is not developed. The mammæ may be fully formed. The development of the external genitals is independent of the development of the internal organs.

Complete absence and rudimentary condition of the uterus may give rise to no local symptoms, except the non-appearance of menstruation. If the ovaries are developed, ovulation with associated monthly disturbance is present and the accumulation of menstrual blood in a rudimentary horn

may call for operative measures to form a channel for its escape. Even on entering married life the condition need not necessarily attract attention; if the vagina be not well developed, the urethra becomes dilated so as to take its place.

In the uterus unicornis, menstruation, conception, and pregnancy may

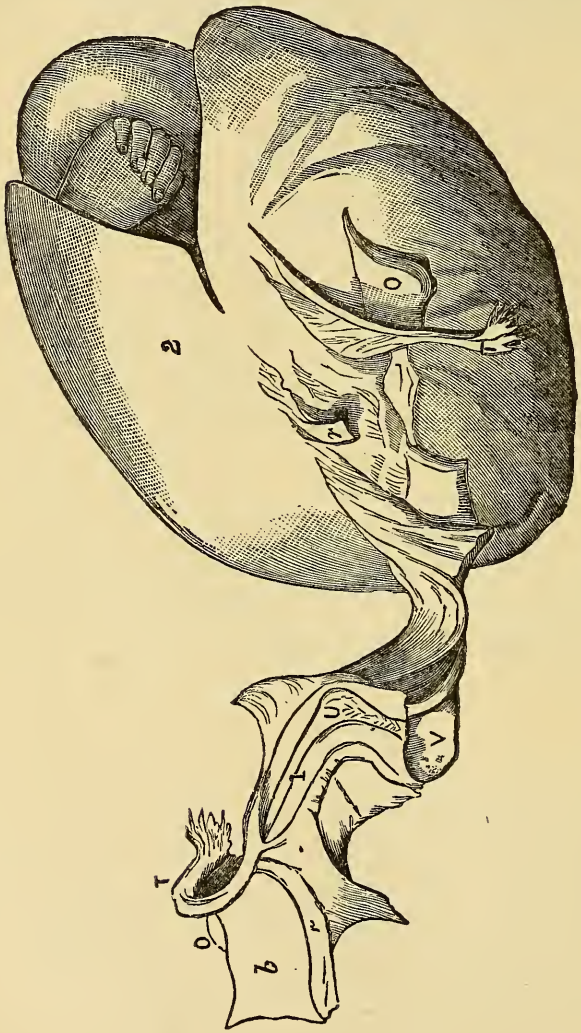

Fig. 145.

One-horned uterus with fœtation in the detached left horn (Turner). The right horn (1) has its ovary (*O*), tube (*T*), round (*r*), and broad (*b*) ligaments in normal relation to it. The gestation sac (2) is on the proximal side of the left round ligament (*r*) and consists therefore of the left horn; this does not communicate with the uterine cavity (*U*). The left ovary (*O*) and tube (*T*) are attached near the round ligament (*r*).

go on undisturbed in the developed horn. It is the *imperfectly developed horn which gives rise to the symptoms*—the result of the retention of menstrual blood and of the products of conception. If the mucous membrane

of this horn discharge blood periodically and there be no communication with the uterus to allow of escape, the blood collects and produces a distended sac. It is of great interest to note that we may have a fertilized ovum growing in the isolated horn ; we have not space here to discuss how this interesting condition is produced (Fig. 145). Uterus bicornis and uterus septus produce no symptoms, unless one-half of the septate uterus does not open into the cervical canal—in which case hæmatometra occurs at puberty (*v.* Chap. XLIII.). The statement that the patient menstruates regularly throws the practitioner off his guard. He should remember that

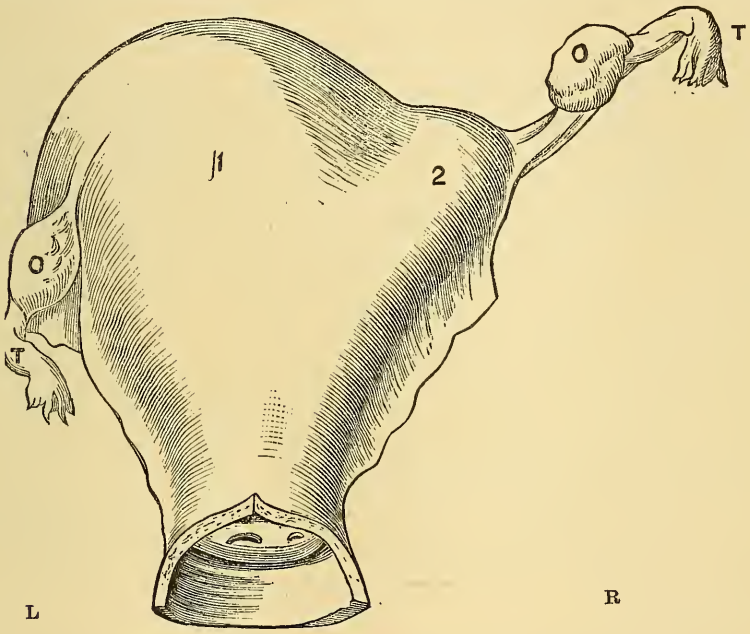

Fig. 146.

Uterus septus (posterior view) from a woman who died in the puerperium (Cruveilhier). The uterine cavity is divided by a septum which extends to the os externum. The left half (1) is strongly developed and contained the fœtus. The right half (2) was empty.

the menstrual blood *may flow undisturbed from one half of the uterus while it is accumulating in the other.* In both of these forms we have two possible seats for a growing ovum (Fig. 146), and thus we can explain some cases of superfœtation ; after a fœtus has begun to develop in one half of the uterus, a second ovum becomes fertilized in the other and reaches maturity at a later period than the first. We may thus also explain some cases in which menstruation occurs during the early months of gestation.

The uterus infantilis and the congenitally small uterus are characterized

by the absence of menstruation and the constitutional nervous disturbance which is usually associated with them.

DIAGNOSIS.

Complete absence of the uterus cannot be diagnosed with certainty in the living subject. A rudimentary condition may be present, and yet not be detected on the most careful examination. To examine cases in which this condition is suspected, we first pass a sound into the bladder and then with one or two fingers of the right hand in the rectum palpate the tissues which lie between the sound and the fingers. It is evident that in such a condition as is represented in Fig. 138 the rudiment of the uterus may escape observation, or be considered as a thickening of the posterior wall of the bladder. We now remove the sound from the bladder, as it only reaches to a limited height in the pelvis, and with the left hand on the abdomen make a careful recto-abdominal examination. To do this last satisfactorily, we anæsthetise the patient. If we feel two bodies laterally without any distinct body between, it is impossible to say whether these are rudimentary horns or ovaries.

The diagnosis of the one-horned uterus is not easy. The points to rely on are the following: the fundus turns to one side of the pelvis, is tapering, and has only one ovary connected with it. The rudimentary horn and the other ovary lie removed from it.

The uterus didelphys is extremely rare. A groove on the external surface of the uterus separating it into lateral halves, so that sounds could be passed into the separate cavities without coming in contact, indicates this condition.

The uterus bicornis is a comparatively frequent condition, and if well marked is easily recognized. Unusual breadth of the fundus with a slight depression in the centre, points to a minor degree of this deformity.

The uterus septus is easily diagnosed if the septum extend as far as the os externum, so as to be within reach of the examining finger. If the septum does not extend so far, the condition may not be detected as there is no change in the external form to direct attention to the internal malformation. The sound may pass with equal ease into either cavity or always into the same, and thus furnish no indication. In a case that came under our own observation the patient was examined frequently during life, bimanually and with the sound, and the uterus pronounced normal.

At the post-mortem, the external appearance of the uterus was normal; it was only on cutting into it that it was observed that the cavity was divided into two portions by a septum which extended to the os internum.

The uterus infantilis and the congenitally atrophic uterus are recognized by the smallness of the uterus. This is most distinctly made out with the finger in the rectum, the uterus being at the same time drawn down and fixed with the volsella. The well-developed vaginal portion and the unusual length of the cervix as felt per rectum enable us to diagnose the infantile from the congenitally small uterus.

PROGNOSIS.

In prognosis we must keep in view the possibility of ovulation with menstrual molimina, the secretion of menstrual blood and its accumulation in a closed cavity, the probability of conception and of gestation in an isolated horn. The most difficult cases are those in which the practitioner has to decide whether marriage is justifiable or not.

TREATMENT.

Malformations of the uterus lie beyond the range of treatment, except when they give rise to retention of menstrual blood or of the products of conception. The treatment of these conditions will be considered under Atresia of the Vagina (see Section VI.), and Extra-uterine Gestation (see Section IX.).

CHAPTER XXIV.

ATRESIA AND STENOSIS OF THE CERVIX UTERI.

LITERATURE.

Barnes—Op. cit., p. 245. *Greenhalgh*—British Med. Jour., June, 1878. *Mackintosh*—Practice of Physic: London, 1836, p. 481. *Schroeder*—Op. cit., S. 64. *Schultze*—Ueber Indication und Methode der Dilatation des Uterus: Wiener med. Blätter, 1879, Nos. 42, 43, 44, 45. *Simpson, Sir J. Y.*—Op. cit., p. 245. *Sims, Marion*—On the Surgical Treatment of Stenosis of the Cervix Uteri: Am. Gyn. Trans., 1878, p. 54. *Smith, H.*—Obst. Jour., London, Vol. V., p. 256. *Thomas*—Op. cit., p. 613.

Definition.—Atresia (α-τρῆσις, non-perforation) is an occlusion of the canal. Stenosis is a concentric contraction of its lumen.

ATRESIA OF THE CERVIX.

ETIOLOGY AND PATHOLOGY.

Atresia is rare as a *congenital* condition ; this is due to the presence of a cap of tissue covering the os uteri. An imperforate condition of the canal throughout its course is seldom, if ever, found.

It is more frequently *acquired*, and results from the following causes :—

Sloughing and cicatrisation after labour ;

Cicatrisation after the application of caustics, and after amputation of the cervix ;

Adhesion of granulations in cervical catarrh (after menopause) and round the base of tumours.

The practical point for the practitioner to remember is that atresia may follow the repeated application of caustics and amputation of the cervix. It occurs also as part of the physiological changes which take place after the menopause. Twenty-eight per cent. of women above fifty years of age have atresia of the cervix (Hennig).

Atresia of the cervix is chiefly of importance in regard to the accumu-

lation of menstrual blood or mucus above the obstruction. It is this which produces the Symptoms and calls for Treatment. It will be better to defer the consideration of these till we treat of Atresia Vaginæ (Section VI.).

STENOSIS OF THE CERVIX.

This condition is described in English and American text-books under "Obstructive Dysmenorrhœa." Dysmenorrhœa is, however, a symptom common to this and many other pathological conditions, each of which is considered under the organ in which it occurs. Stenosis of the os externum is a precise pathological condition which requires a definite line of treatment.

PATHOLOGY.

The common seat of the stenosis is at the *os externum*. It is a disputed point whether there is ever stenosis (as we have defined it) at the os internum. Barnes says that when he has found the obstruction at the os internum it was almost always due to flexion of the uterus. The obstruction is, in such a case, not a true stenosis ; it might be compared to the kink produced on a gutta-percha tube when it is bent. Spasmodic contraction of the muscular fibres surrounding the os internum, taking place at the menstrual period, is adduced by some to explain the symptoms of dysmenorrhœa.

In the congenital variety, the cervix is conical in form (Fig. 147) and

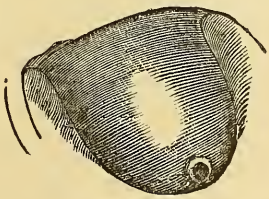

Fig. 147.
Conical vaginal portion (Barnes).

of unusually firm consistence. Sometimes it is hypertrophied, the vaginal portion measuring as much as two inches (Barnes). The os is small, and appears as a pin-hole on the extremity of the cervix. The contrast between this and the normal os is well seen in Fig. 149. The cervical canal above the obstruction is often dilated into a spindle-shaped cavity (Fig. 148).

ETIOLOGY.

Like atresia, stenosis of the cervix is congenital or acquired. The commonest causes of the acquired form are cicatrisation after labour, after amputation of the cervix, and after the repeated application of strong

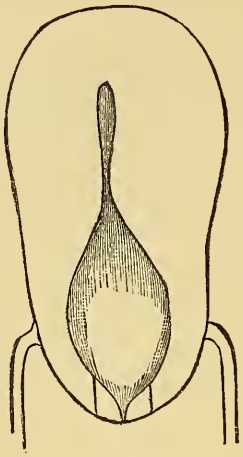

Fig. 148.

Stenosis of os externum, with dilated cervical canal (Mundé). The parallel lines beside the os show the extent of the bilateral incision.

caustics; the last is perhaps the most frequent cause. Inflammation of the mucous membrane, resulting in adhesions, also produces it.

SYMPTOMS.

The symptoms primarily produced by the stenosis are *dysmenorrhœa, sterility, dyspareunia.* In addition, there is in some cases *menorrhagia.* If the condition exist for a time, pelvic peritonitis or ovaritis may complicate the case.

The cause of the dysmenorrhœa is evident. The menstrual blood is poured into the cavity of the uterus, the contracted condition of the outlet prevents its escape, it coagulates, the coagula excite uterine contractions which are accompanied with pain. Hence the menstrual blood is usually discharged as clots. In the first instance, the simple mechanical obstruction is the cause of the dysmenorrhœa. Other pathological conditions, as endometritis and metritis, arise secondarily; and the monthly congestion of the tissues, thus diseased, will also produce pain. We shall refer to this subject again under Anteflexion of the Uterus.

The association of sterility with a conical cervix and pin-hole os has been for a long time recognised. We are not able to explain why a narrow os should lessen the probabilities of fertilization, yet it is a well-observed fact that it does so.

Sterility due to this cause is amenable to treatment, and presents the most satisfactory cases which the practitioner has to deal with, as by the simple operation to be presently described he may remove the great opprobrium of married life.

DIAGNOSIS.

The history of dysmenorrhœa and sterility may have already led us to suspect this condition; but since these symptoms as frequently accompany anteflexion, we have recourse to the physical examination.

The conical cervix projecting markedly into the vagina attracts atten-

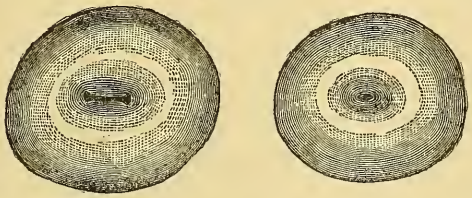

Fig. 149.
Normal and pin-hole os, as seen in the speculum (Schroeder).

tion. On feeling for the os uteri, the first impression is that it is absent; more careful examination detects a slight depression.

The speculum shows the appearance represented in Fig. 149. The normal os uteri is placed alongside, to be compared with it.

The sound is passed with difficulty; sometimes a surgical probe is all that the orifice will admit. After it has passed the os externum, the instrument may enter a dilated cervix (Fig. 148).

PROGNOSIS.

This will depend on (1) the existence of stenosis of the os externum uncomplicated by anteflexion, (2) the absence of pelvic peritonitis and ovaritis. If these conditions are fulfilled, the prognosis is favourable as regards the cure of the dysmenorrhœa and probably so as regards the cure of the sterility. As regards the latter, however, we must remember that there are many other causes which may be operative and may escape

detection. All that we can say to the patient is, that by operative procedure we can *increase the probability* of the occurrence of pregnancy.

TREATMENT.

The methods of treatment are—

A. Dilatation,

B. Division.

Dilatation of the stenosis is carried out by passing graduated bougies, by sponge or laminaria tents, by forcible dilatation with instruments. Division is effected by the metrotome or by scissors.

A. Dilatation.

Dilatation by means of *graduated bougies* was brought into prominent notice by Dr. Macintosh, who employed straight metallic bougies of different degrees of thickness. He passed first a small one not thicker than a probe, and then larger ones till the os was rendered quite patulous.

Sponge and laminaria tents have also been largely used. The objection to them, as well as to the dilatation with graduated bougies, is that the cure is only temporary. With a laminaria tent we may dilate the stenosis so that the finger easily passes it, but in a few days it will have contracted to its original size. The use of tents is also attended with the risks of cellulitis, peritonitis, and even septicæmia (see p. 137).

Forcible dilatation is effected by Schultze of Jena with the dilator represented at Fig. 150. He dilates the cervical canal beforehand with lami-

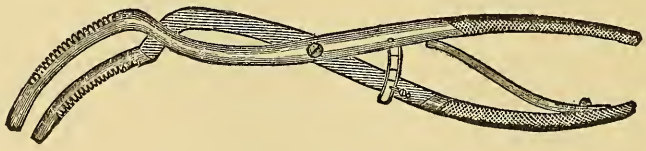

Fig. 150.

Schultze's dilator.

naria; he then washes it out with a 2 per cent. solution of carbolic acid, as he attributes many of the serious consequences of forcible dilatation and incision to the absorption of the secretions. The dilator is now introduced, and the blades (which open antero-posteriorly) are forcibly separated. We have had no experience of this method of treating stenosis.

The dilator employed by Marion Sims is seen at Fig. 151.

B. Division.

Division of the cervix with the knife was introduced by Sir James Simpson. The instrument which he devised for this purpose was the *metrotome* represented at Fig. 152.

It is a bistoury caché, with a single blade sharp on the outer edge which is unsheathed on compressing the handle. The screw on the handle regulates the extent to which the blade is to be protruded. The instru-

Fig. 151.

Marion Sims' dilator (Sims).

ment was passed in till the point almost reached the os internum ; it was turned with the blade to one side, and then withdrawn, the handle being at the same time more and more compressed. The result was a lateral incision in the cervix, superficial at its upper extremity but becoming deeper as it passed downwards till at its base it completely divided the intra-vaginal portion. The instrument was re-introduced and a similar incision made on the opposite side. The extent of this bilateral incision

Fig. 152.

Sir James Simpson's metrotome (Sir J. Y. Simpson). *a*, shows position of blade when protruded.

is seen in Fig. 153. The result of this operation is that the narrow circular os becomes an orifice with gaping lips.

By effecting this change in the form of the os uteri, we not only remove the obstruction to the outflow of the menstrual blood but also favour the entrance of the spermatozoa into the cervical canal. As Sir J. Y. Simpson points out, we make the nulliparous os resemble in form the os of a uterus which has been pregnant ; that is, instead of being circular and small, it is made transverse and gaping (cf. Figs. 154 and 155). That

a patulous condition of the os and cervical canal greatly favours fertilisation is proved by the readiness with which conception follows abortion.

Other forms of metrotome have been introduced by Coghill, Greenhalgh, Savage, and Routh. Those of Greenhalgh and Savage are double-bladed, while that of Routh has the blades curved.

We are indebted to Marion Sims for substituting the *scissors* for the

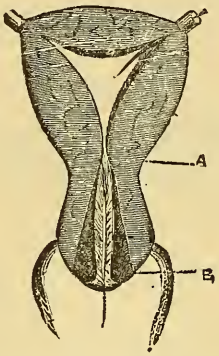

Fig. 153.

Incision made by metrotome (Sir J. Y. Simpson). The dark-shaded portion, B, represents extent of incision; A, os internum.

metrotome. The objections to the latter instrument are that we do not know how deep the incision is being made, nor whether both incisions are being made equally. The practitioner will find the scissors easier to handle than the knife. A pair of ordinary strong scissors will do, provided they are sharp and the cervix be firmly held with the volsella. The

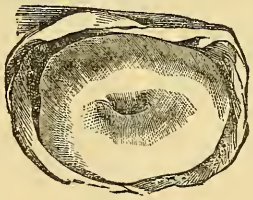

Fig. 154.

Nulliparous os uteri (Sir J. Y. Simpson).

scissors of Kuchenmeister (Fig. 110) and Hart (Fig. 111) have this advantage, that the hook on the external blade prevents the cervix from slipping out as the section is being made.

The operation is performed as follows: The patient is placed semi-prone. The Sims speculum is passed and held by an assistant; if Bat-

tey's speculum is used, an assistant is not necessary. We recommend that this operation, as indeed all operations on the cervix or vagina, be performed under continual irrigation from a vaginal douche. It is difficult to do this in private practice and without assistants; but, if always carried out, the possibility of cellulitis and peritonitis is reduced to a minimum. If the irrigation be not employed, the vagina should be thor-

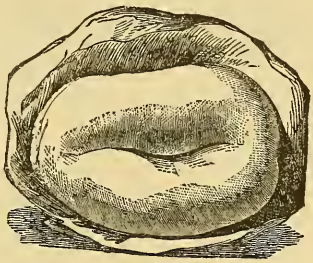

Fig. 155.
Parous os uteri (Sir J. Y. Simpson).

oughly syringed beforehand with 1 to 40 carbolic acid solution. The anterior lip of the cervix is laid hold of with the volsella; the scissors are introduced, the straight blade being passed within the cervical canal; the point or hook of the external blade is carried to about half-way up the cervix (see Fig. 156 and Fig. 148) and the section made. In many cases, all that is necessary is to divide the ring round the os externum; when this

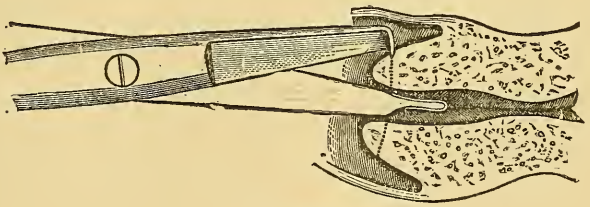

Fig. 156.
Showing the bilateral division of the cervix, with Kuchenmeister's scissors (Barnes).

is divided, we find the cervical canal dilated above it. In this respect this operation differs from that of dividing the posterior lip (see under Anteflexion), in which it is essential to make the scissors cut as far as the reflexion of the mucous membrane at the fornix. Should the cervical canal not be patulous, it may be necessary to make the incisions extend deeper —to the base of the vaginal portion. There is generally not much bleeding after the section is completed, but we watch a few minutes to see. If

there is none, a vaginal tampon is not required. Should hemorrhage occur, some perchloride of iron is swabbed on the cut surface and a vaginal tampon of lint soaked in carbolised oil is applied.

More important than the incision is the after-treatment. The patient must be seen on the following day, and every second day for a fortnight,

Fig. 157.

Glass plug to keep the cervix patulous after division (Thomas).

and the finger passed in on each occasion to prevent union of the cut surfaces and dilate the cervical canal. To keep the canal open, Thomas recommends the use of a glass cervical plug (Fig. 157), kept in position by a solid plate of the form of an Albert Smith pessary. This is useful after division of the posterior lip, but we think that it is not necessary after the bilateral incision.

CHAPTER XXV.

ATROPHY OF THE CERVIX AND UTERUS; SUPERINVOLUTION.

We meet with an atrophic condition of the cervix and uterus under four different conditions :—

1. As a congenital condition ;
2. Associated with certain constitutional affections, as phthisis, scrofula, chlorosis ;
3. In the puerperal uterus, as the result of superinvolution ;
4. After the menopause.

Should the student find on vaginal examination that the cervix is small and projecting only slightly into the vagina, and on bimanual examination that the body of the uterus is found with difficulty and is smaller than it should be, he must next ascertain which of the above-mentioned causes has produced the atrophy.

The history will enable him to form his diagnosis. With the *congenital condition* there is a history of amenorrhœa or scanty menstruation since puberty, of sterility if the patient has entered married life, and of hysteria and other disturbances of the nervous system which usually accompany imperfect development of the uterus. The *constitutional condition*, and especially the state of the blood and of the lungs, in other cases enables him to account for the condition of the uterus. Probably the small uterus found in chlorotic patients is a congenital condition, and not secondary to the constitutional state. If the atrophic condition be the result of *superinvolution*, there is a history of childbirth with non-appearance of menstruation after it. With regard to the *menopause*, the age of the patient is the chief guide ; we must remember the possibility of an early menopause, as early as at the age of thirty-five.

The only atrophic condition which we shall consider here is that occurring in the puerperal uterus as the result of superinvolution. To Sir James Simpson's description of this condition we are chiefly indebted.

SUPERINVOLUTION OF THE UTERUS.

LITERATURE. *Frommel*—Ueber puerperale Atrophie des Uterus: Zeits. f. Geburts. und Gynäk., Bd. vii., H. ii., S. 305. *Jaquet*—Berl. Beiträge zur Geburts. und Gynäk., Bd. ii., S. 3. *Klob*—Patholog. Anatom. der weib. Sexualorgane: Wien., 1864, S. 205. *Simpson, Sir J. Y.*—Med. Times and Gazette, 1861. Diseases of Women: Edin., 1872, p. 547.

PATHOLOGY.

The uterus is small. Its external length may be reduced from the normal 3 to $1\frac{3}{4}$ inches. The walls are thin and flaccid, sometimes of a dense and fibrous consistence. The vaginal portion projects only slightly into the vagina, and may be almost flush with the vaginal roof. The os may be relatively patulous, or contracted, so as only to admit a probe. The uterine cavity is reduced to $2\frac{1}{4}$, 2, or even $1\frac{1}{2}$ inches in length. The ovaries are atrophied, and sometimes show an increase of fibrous tissue in their structure. The accompanying specimen (Fig. 158), described by Sir James Simpson, illustrates these points.

ETIOLOGY.

As to the frequency of this condition, Frommel found it present in 28 out of 3,000 gynecological cases, that is in almost 1 per cent. The reason why, in certain cases, the process of involution during the puerperium goes on till the uterine cavity is reduced to less than $2\frac{1}{2}$ inches in length is not known. *Protracted Lactation* seems the most important cause (Frommel). We have seen this in two cases, and Chiari has also drawn attention to it. In some instances there is a history of great *loss of blood* at the confinement; in a case of this, reported by Whitehead,[1] the atrophic changes had progressed so far that no trace of a uterus was found on the most careful examination. In other instances *pelvic peritonitis* has occurred during the puerperium; this can produce, we know, atrophy of the ovary through binding it down with adhesions; and atrophy of the ovaries may lead to atrophy of the uterus. It is also associated with the *tubercular diathesis* (Klob).

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[1] British Med. Journ., Oct., 1872.

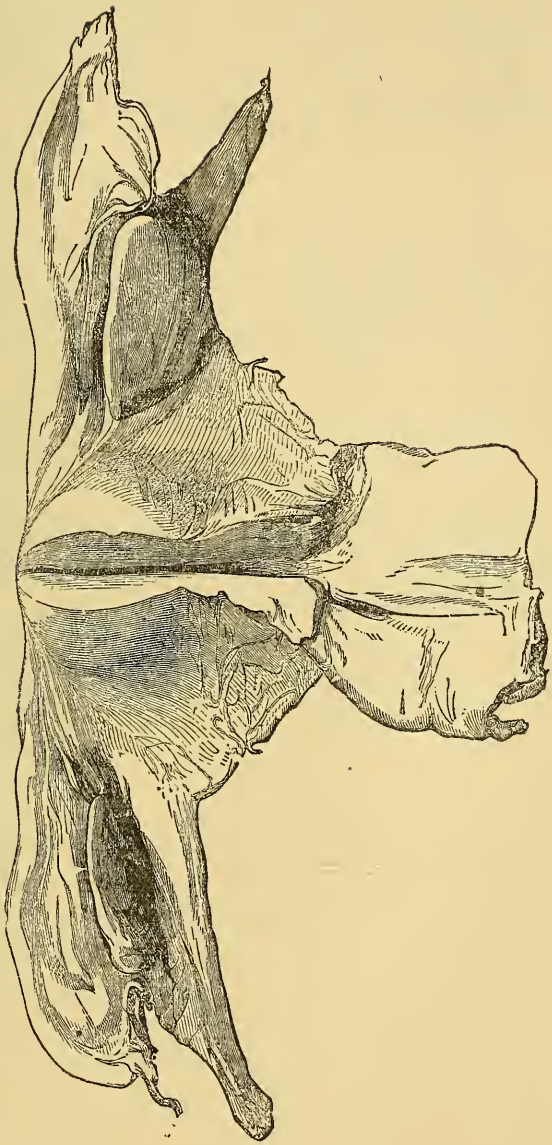

Fig. 158.

Preparation of uterus and ovaries in a case of superinvolution *ad naturam*. Weight of parts represented—one ounce, four drachms, twenty-five grains. Uterine cavity measures 1¼ in. Thickness of posterior uterine wall (laid open in figure) ¼ in. Tissue of uterus, dense and fibrous. Ovaries atrophied, with increase of fibrous tissue and no appearance of Graafian vesicles (Sir J. Y. Simpson).

SYMPTOMS.

Continued amenorrhœa is the symptom which leads the patient to seek advice. After she has ceased nursing, she expects the flow to return. It does not do so, however, even after months have passed. Pain in the back, weakness and hysterical symptoms are also present.

DIAGNOSIS.

The small cervix at once suggests what the condition is. We sometimes have difficulty in making out the uterus bimanually; here the examination per rectum, combined with the volsella, is useful. The best idea of the size of the uterus is gained by pressing the ball of the finger in the rectum against the isthmus of the uterus, and then moving the uterus upwards and downwards upon the finger which can thus estimate accurately its size; having done this, we make more traction on the uterus to bring it as far down as possible, and examine the ovaries.

The sound must be used with care, as it easily perforates the thin walls of the uterus. It does not pass into the uterus as far as the $2\frac{1}{2}$ in. knob.

Differential diagnosis must be made from—

Congenital malformation;
Congenital atrophy;
Senile atrophy.

TREATMENT.

This consists in stimulating the uterus to hypertrophy by placing a foreign body in its cavity. The galvanic intra-uterine stem pessary of Sir James Simpson is the best instrument for this purpose. The stem is made in its upper half of zinc, in its lower half of copper; the bulb is also of copper. The form of it is seen in Fig. 159, which is drawn full-size. The stem should always be shorter than the uterine cavity by a quarter of an inch; otherwise it may perforate the fundus. It is introduced as follows. The cervix is laid hold of with the volsella to draw it towards the vaginal orifice and to steady it. The stem is held with the bulb between the finger and thumb, and passed into the cervix for about an inch. If the vaginal orifice be too narrow to allow of this manipulation, the bulb is fixed on the end of a staff (Fig. 159) and thus carried in. Once the stem is within the cervix difficulty is sometimes felt in pressing it onwards.

The following manœuvre facilitates this. Pass the index finger of the right hand well upwards into the rectum till the point of it gets fairly behind the cervix and fixes it; now put the thumb into the vagina, and h it make pressure on the bulb which is thus between the thumb and

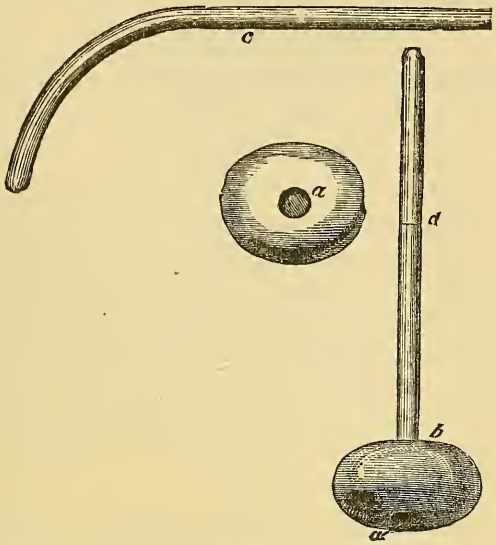

Fig. 159.

Galvanic intra-uterine stem ($^1/_1$). *a*. perforation in bulb of stem for the staff, *c*, used to introduce it; the stem is of copper from *b* to *d*, of zinc from *d* to the point (Sir J. Y. Simpson).

finger (the posterior wall of the vagina of course intervening), and the stem can be satisfactorily pushed home.

A glycerine plug is passed to keep the stem in position at first. The patient should keep at rest for one day after the stem has been introduced, and should be instructed to send at once if pain is felt in the pelvis; we have seen pelvic inflammation follow the introduction of a stem pessary. Should the practitioner not be within call, it is a good plan to tie one piece of string to the bulb and another to the plug, so that the patient can draw them out herself when symptoms of inflammation arise. The pessary can be worn for months without being removed, does not interfere with menstruation, and keeps its position without any plug in the vagina.

CHAPTER XXVI.

HYPERTROPHY OF THE CERVIX; AMPUTATION.

LITERATURE.

Byrne—Amputation and Excision of the Cervix Uteri: Trans. Americ. Gyn. Soc., Boston, II., pp. 57 and 110. *Galabin*—Lond. Obst. Journ., Sept., 1878. *Goodell*—Clinical Notes on the Elongations of the Cervix Uteri: Am. Gyn. Trans., 1880, p. 268. *Hegar und Kaltenbach*—Operative Gynäkologie: Stuttgart, 1881, S. 445. *Huguier*—Memoires sur les Allongements Hypertrophiques du Col de l'Uterus, Paris, 1860. *Leblond*—Op. cit., p. 448. *Marckwald*—Ueber die kegelmantelförm. Excision der Vaginal-Portion, etc.: Archiv. f. Gyn., Bd. viii., S. 48. *Schroeder*—Charité-Annalen, 1878; and Zeitschrift für Geburt. u. Gyn., Bd. iii., S. 419; Bd. vi. Hft. 2, S. 218. *Simon*—Monatsch. f. Geburtskunde, xiii., S. 418. *Sims, Marion*—Uterine Surgery, p. 264.

Hypertrophy of the whole uterus occurs in two forms:—

1. Hypertrophy of the muscular tissue—in pregnancy;
2. Hypertrophy of the connective tissue—in subinvolution and chronic metritis, both of which will be considered under chronic metritis.

Hypertrophy of the cervix alone calls for special notice here.

HYPERTROPHY OF THE CERVIX.

Under this head we consider two conditions:—

A. Hypertrophy limited to the vaginal portion, which is a distinct *primary* lesion;

B. Hypertrophy of the supra-vaginal portion which is usually associated with hypertrophy of the body of the uterus, this occurs in prolapsus uteri and is probably *secondary* to that condition.

A. HYPERTROPHY OF THE VAGINAL PORTION.

Pathology.—The peculiarity of this condition is that the cervix is normal in every respect except length (Fig. 161). The mucous membrane

and the subjacent tissue are not thickened, so that the diameter of the cervix is not much increased. As the result of the increase in length, the conical apex of the cervix comes to lie immediately behind the hymen and

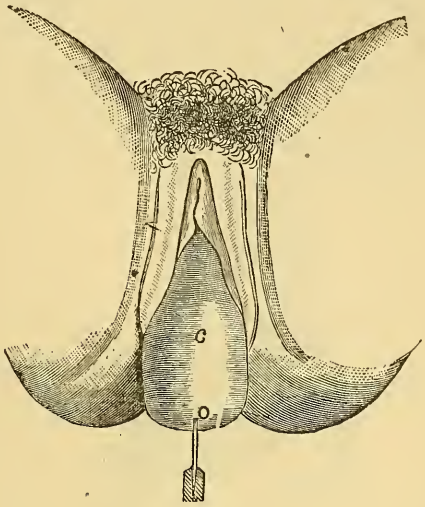

Fig. 160.

Hypertrophied vaginal portion, *c*, protruding through the vulva. The sound has passed very far into the small os, *o* (Schroeder).

may protrude through the vaginal orifice (Fig. 160). The os externum is often small.

Etiology.—This condition is a true hypertrophic growth ; it is not very common and the cause of it is unknown. As it occurs in the virgin, it is probably congenital. Sometimes it does not attract attention till the patient enters married life, when it produces, as a rule, sterility, because the form of the cervix interferes with conception.

The cervix is frequently *thickened* as the result of chronic inflammation consequent on laceration of the cervix in child-birth ; this is not a true hypertrophic growth, and will be considered under Laceration of the Cervix (Chap. XXVII.).

Symptoms.—The symptoms are due to the presence of the hypertrophied cervix in the vagina. There is bearing down as in prolapsus uteri, irritation of the mucous membrane of the vagina and consequent leucorrhœa, discomfort on walking about and on rising suddenly. If the cervix protrude beyond the vulva, ulceration of its mucous membrane and excoriation are produced.

Diagnosis.—This presents no difficulty. The fornices are found in

their normal position on vaginal examination (see Fig. 161), the fundus uteri at its normal height in the pelvis on bimanual examination. These two clinical facts indicate that the low position of the apex of the cervix is not due to a descent of the fundus but a hypertrophy of the cervix, and that the hypertrophy of the cervix is limited to the portion which projects into the vagina (*cf.* Fig. 161 with Fig. 169 and Fig. 170). The sound will pass five inches or more into the cervical canal: as the patient is usually a nullipara and the abdominal walls therefore firm, it facilitates

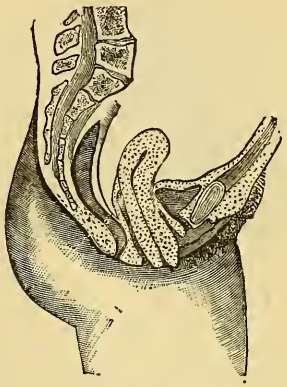

Fig. 161.

Hypertrophy of intra-vaginal portion of cervix. Neither fornix is obliterated (Schroeder). Section of pelvis seen in Fig. 160.

the bimanual to do it with the sound in the uterus. The combined recto-vaginal examination shows that the uterus, above the vagina, is of normal length.

Treatment.—This consists in amputation of the cervix, which is the only course open to us, because the hypertrophy will not diminish but rather increase. Amputation is performed by three methods :—

1. Scissors or knife,
2. Ecraseur,
3. Galvano-caustic wire.

The successive improvements in the method of amputation *with the knife* may be thus tabulated; by Marion Sims was made the advance of covering the stump with mucous membrane.

(1.) *Old* method. Circular amputation; raw surface touched with caustic or cautery; healing by granulation.

(2.) *Sims'* method. Circular amputation; vaginal mucous membrane stitched to vaginal mucous membrane; healing partly by first intention (Fig. 162).

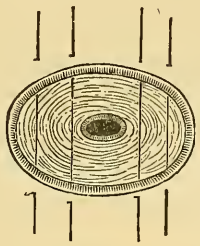

Fig. 162.

Sims' method of passing the suture. Vaginal mucous membrane stitched to vaginal (Sims).

(3.) *Hegar's* method. Circular amputation; vaginal mucous membrane stitched to cervical mucous membrane (Fig. 167); healing by first intention.

(4.) *Simon and Marckwald.* Flap amputation by wedge-shaped excision of lips separately (Fig. 163); vaginal mucous membrane stitched to cervical on each lip (Fig. 165); healing by first intention.

As there is often considerable hemorrhage, it is well to place a constricting band on the cervix above the point of section. A common

Fig. 163.

Marckwald's method of splitting the cervix into an anterior and posterior lip, and then uniting cervical to vaginal mucous membrane (Schroeder).

India-rubber umbrella ring serves admirably to control hemorrhage in this and in Emmet's operation for lacerated cervix. The ring is warmed

beforehand to make it less rigid, and slipped over the handle of the volsella which grasps the cervix; after the operation is completed we notch it with the scissors, and thus gradually slacken it before finally cutting it through.

The best method of performing the amputation is to split the cervix by a transverse incision into an anterior and posterior lip; then amputate each lip separately, making the line of amputation wedge-shaped; finally bring together the projecting flaps of vaginal and cervical mucous membrane with wire sutures.

The Operation.—The instruments required are the following:—

Antiseptic douche,
Sims' speculum,
Spatulæ,
Volsella,
India-rubber ring,
Straight needles fixed on handles,
Silver wire,
Bistouries,
Dissecting forceps,
Blunt hook,
Scissors,
Artery forceps,
Small curved needles and needle holder.

A. R. Simpson operates as follows: The patient is placed in the lithotomy posture. Continued irrigation with a 2 p. c. solution of carbolic is employed. The cervix is drawn down with volsella; an India-rubber ring is passed over the volsella on to the cervix and placed so as to constrict the cervix just below the fornices (Fig. 164). The cervix is pierced in the middle line from below with a straight needle on a fixed handle. A straight needle passes more easily through the dense tissue of the cervix; if the cervix does not project sufficiently through the vulva to allow of the straight one being used, a curved one is required. When the point of the needle projects as far as the eye, this is threaded with a *long* wire suture and then drawn back (Fig. 164, *M*, *N*). A similar thread is carried through on either side of the middle line so that the cervical canal is pierced with three long sutures, one in the middle of it, and one at each side of it. The cervix is now split horizontally with the

knife or scissors so as to divide it into an anterior and posterior lip; this horizontal section is carried as far as the sutures, so that they are exposed

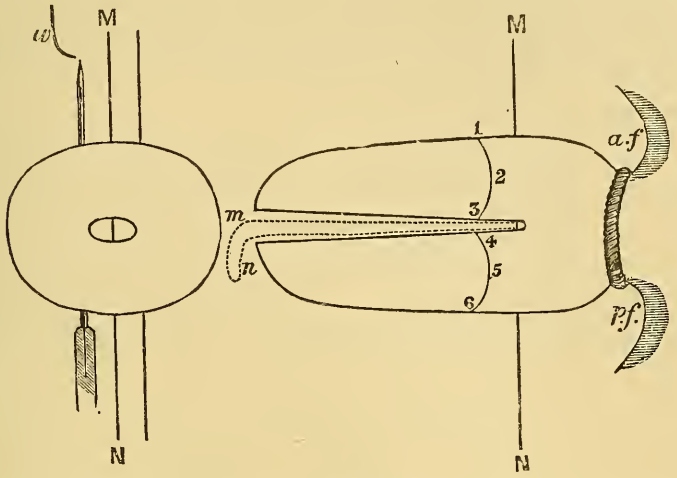

Fig. 164.

Diagram of amputation of cervix. To the right is seen the cervix with the ring constricting it, a suture, *M*, *N*, in position, the cervix split and the line of amputation marked 1 to 6; *a*, *f*, anterior, and *p*, *f*, posterior fornix. To the left is seen the cervix in cross-section; two threads are passed and the needle carried through, but not yet threaded with the wire *w*.

at the bottom of the incision. We now hook them up in turn and drag the loop of each down through the wound (Fig. 164, *m*, *n*). Each loop is then divided; the three sutures are thus converted into six—three

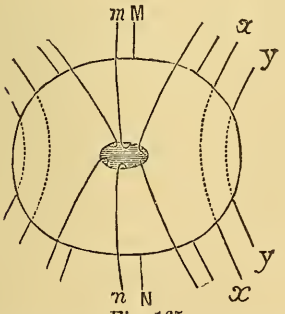

Fig. 165.

The suture *MN* has been divided and the halves brought down as *Mm*, *Nn*; the lateral ones also. *x*, *x* and *y*, *y* are additional side sutures.

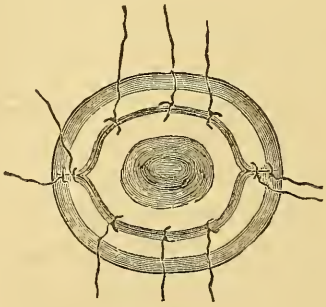

Fig. 166.

Appearance of stump of Fig. 165 when sutures are twisted up.

through the base of each lip. A portion of the anterior lip is now excised along the line 1, 2, 3. The sutures are now used to bring together the margins of this amputation. The posterior lip is next treated in the same

way. Additional sutures are put in on each side to close in the side walls of the cervix (Fig. 165, *x* and *y*). When the cervix is not unusually thick, these lateral sutures are passed as in Fig. 165; but when the cervical walls are thick, it makes a neater stump to bring these sutures also out through the cervical canal and unite vaginal to cervical mucous membrane all round (see Fig. 167, *x* and *y*).

The peculiarity of this method of operating is, that the sutures are introduced before the knife is used. The advantages of this are the following: it is easier to pass the needle through the dense tissue when the cervix is fixed with the volsella; the sutures serve as a means of traction when the portion grasped by the volsella has been cut away; we can ligature the flaps immediately after the lip has been amputated and thus

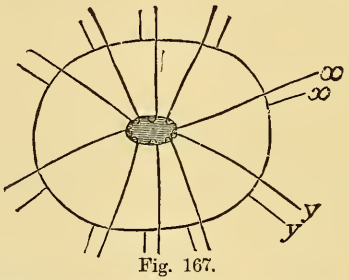

Fig. 167.

Mode of passing sutures when stump is very thick.

check hemorrhage—this refers specially to amputation in prolapsus uteri, where we cannot constrict the cervix with a ring.

The appearance of the stump after the sutures have been twisted is seen at Fig. 166. Wire sutures are most convenient in all operations on the cervix or vagina, because they are most easily removed. They should be twisted or tied; the ends are left long enough to protrude clear of the vulva; the free ends of the same suture are twisted together to keep them separate from the others; finally, all the ends are wrapped in a piece of lint to prevent their fretting the labia.

Removal of the Sutures.—The sutures are removed in a week's time. The patient is put in the Sims position and the Sims speculum passed. Slight traction is made on a suture, and if the twisted knot is visible, we clip the wire with the wire scissors. Generally we find the knot is embedded in tissue; in which case the rake (Fig. 168) is used to hook up the loop. In snipping the loop we place one blade of the scissors under it, and then press the tissue back from the wire so as to divide the loop as far away from the knot as possible.

Amputation with the *Ecraseur* or with the *Galvano-caustic wire* is not such a neat method of operating as with the knife. Further, there is liability to closure of the cervical canal through cicatrisation; this may be prevented by introducing a stem pessary after amputation. The galvano-caustic wire is recommended by Barnes, Thomas, and others; its use has

Fig. 168.

Point of rake; although finely made, it should be blunt.

been followed with remarkably good results in the hands of Byrne of Brooklyn, whose valuable paper on this subject should be consulted.

The method of using the ecraseur and galvano-cautery will be described under Amputation of the Cervix for Carcinoma (see Chap. XL.).

With the galvano-caustic wire we must see that the wire does not *slip downwards*, and thus "scalp" instead of amputating the cervix. The fact that the galvano-cautery diminishes hemorrhage is of no advantage in amputating the hypertrophied cervix. The use of the india-rubber ring makes this a bloodless operation; and the introduction of the sutures in the way described minimizes the danger of hemorrhage where the ring is not employed.

B. HYPERTROPHY OF THE SUPRA-VAGINAL PORTION.

The existence of hypertrophy limited to the supra-vaginal portion of the cervix and not affecting the body of the uterus cannot be determined by *clinical* examination alone. The obvious reason is that we have no means of ascertaining in a case of hypertrophy where the precise upper limit of the cervix lies. The position of the os internum is not indicated by the sound, and the distance to which the utero-vesical pouch of peritoneum descends can only be ascertained on post-mortem examination. We cannot affirm, therefore, that the hypertrophy is limited to the supra-vaginal portion of the cervix and that it does not affect the body of the uterus as well.

In the present state of our knowledge it is impossible to say whether this hypertrophy is primary or secondary. We believe that in the great proportion of cases it is secondary to prolapsus uteri.

By French and by many German gynecologists, however, hypertrophy

of the supra-vaginal portion of the cervix is considered a distinct primary lesion. Huguier first drew attention to the increase in the length of the uterine canal in cases described as prolapsus uteri; he affirmed that the

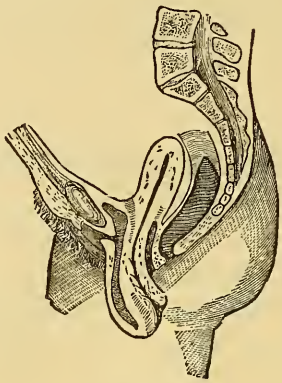

Fig. 169.

Hypertrophy of intermediate portion of cervix. The anterior fornix is obliterated (Schroeder).

fundus uteri always remained in its normal position, and that the os externum came to lie outside the vulva *because* the cervix had increased in length; this hypertrophied condition of the cervix was occasioned by a

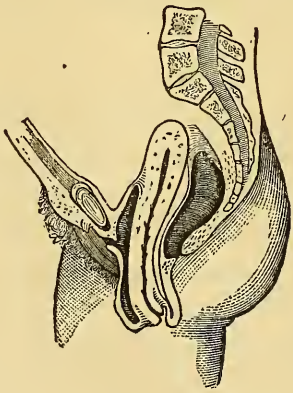

Fig. 170.

Hypertrophy of supra-vaginal portion of cervix. Both fornices are obliterated (Schroeder).

prolapse of the vaginal walls which made traction on the cervix, and thereby stimulated it to increased growth.

By these gynecologists, three forms of cervical hypertrophy are described according to the portion of the cervix which is hypertrophied. The division of the cervix into three portions—a vaginal, an intermediate,

and a supra-vaginal portion—has been already described (see page 16). The vaginal portion is limited superiorly by the insertion of the anterior fornix; the intermediate by that of the posterior fornix; the supra-vaginal by the os internum. Hypertrophy of the vaginal portion is characterised by the *persistence of both* fornices in their normal position; it has been already described (see Fig. 161). In hypertrophy of the intermediate portion the posterior fornix remains, while the *anterior is obliterated* (see

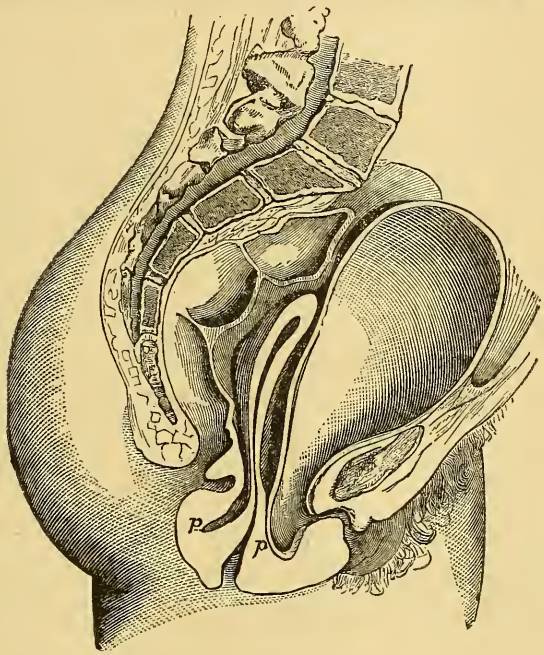

Fig. 171.

Prolapsus uteri with cervical hypertrophy (Barnes); *p*, *p*, peritoneum.

Fig. 169). In hypertrophy of the supra-vaginal portion *both anterior and posterior fornices are obliterated* (see Fig. 170).

In the accompanying preparation (Fig. 171), described by Barnes, the hypertrophy affects both uterus and cervix—if we take the utero-vesical pouch of peritoneum as indicating the position of the os internum. Winckel figures and describes a similar specimen (Die Pathologie der weiblichen Sexual-Organe, Tafel XIX*a*.).

As we have already said, we consider supra-vaginal hypertrophy to be merely one of the consequences of prolapsus uteri, under which its etiology, pathology, and diagnosis will be considered (*v.* Section VII.).

Treatment.—The amputation of the hypertrophied cervix, though a part of the treatment of prolapsus uteri, is most conveniently considered here, as it resembles the amputation in simple primary hypertrophy of the vaginal portion. In amputating for supra-vaginal hypertrophy, however, the *relations of the bladder and peritoneum* of the pouch of Douglas require to be considered. The bladder invariably descends for a varying distance in relation to the front of the hypertrophied cervix. The peritoneum of the pouch of Douglas, inasmuch as it lines the upper part of

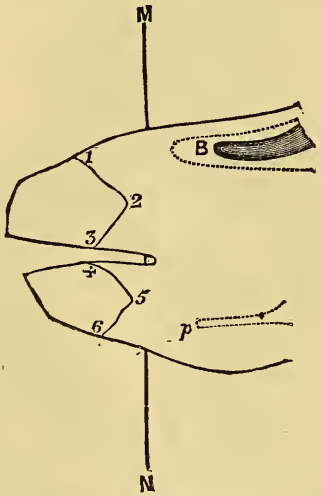

Fig. 172.

Amputation of hypertrophied cervix in prolapsus uteri. *B*, sound in bladder; *p*, peritoneum of pouch of Douglas. The sutures are passed as *M*, *N*, and the cervix split laterally, so as to form an anterior lip which is amputated along lines 1, 2, 3, and a posterior lip amputated along 4, 5, 6.

the posterior vaginal wall, will, when that wall is averted, dip down alongside of the hypertrophied cervix. If the posterior fornix is not obliterated, the peritoneum will not descend alongside of the protruding cervix.

The relations of the bladder and peritoneum are represented diagrammatically in Fig. 172. The line of reflection of the posterior vaginal wall on to the cervix indicates how much is vaginal portion, and by entering the needle below that line we keep clear of the pouch of peritoneum. The sound passed into the bladder will show us how far down that organ comes, and the needle is brought out an inch below that point.

The steps of the operation are the same as in the former case. A much smaller portion is excised here.

CHAPTER XXVII.

LACERATION OF THE CERVIX.

LITERATURE.

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The recognition of laceration of the cervix as a distinct and important lesion, with the operation introduced for its cure, is one of the many gynecological advances of the last twenty years. For this we are indebted to the genius of Dr. Emmet, of New York, who first drew attention to the clinical significance of the lesion and elaborated the operation for its removal. Sir James Simpson had previously drawn attention to its frequent occurrence, and its importance as a diagnostic of parturition. Roser, of Marburg, had described the pathology of the condition ; but its importance

as a factor in uterine disease was brought into notice by Emmet's first paper which was published in 1869, seven years after he had instituted the operation for its cure.

As the subject of laceration has only recently received attention and is at present a *quæstio vexata* in gyneocology, we have given a full bibliography. After the writings of Emmet himself, the student might refer to Roser, Ruge, and Veit for the pathology of the lesion ; to Mundé's article for diagnosis ; and to the papers by Pallen and Lee for operative treatment.

PATHOLOGY.

The commonest *seat* of the laceration is to the front and left side of the cervix, probably because the long diameter of the child's head is most commonly in the right oblique diameter of the pelvis, and the thicker end of the wedge is to the front. The next in frequency is a double laceration—to the front and left, and to the back and right sides. Less frequently is the laceration at either end of the left oblique diameter. We have found lacerations to the front and right side in cases where the head presented right occipito-anterior. The *form* of the laceration is various—single (see Fig. 173), double (see Plate VIII., Fig. 2), or multiple (see Fig. 174). The *extent* of the laceration varies, from a mere indentation of the ring of the os externum to a gaping fissure separating the lips of the cervix up to the vaginal fornices. Occasionally it extends into the roof of the vagina, and is marked by a cicatricial band drawing the cervix to one

Fig. 173.

Single laceration. The flaps are held apart with a double tenaculum (Emmet).

side. We have noted this in forceps cases, specially when the forceps had been applied before the os was dilated.

The *result* of the laceration is that the mucous membrane of the cervical canal is exposed ; and, partly as an immediate result of the injury, partly from friction against the vaginal walls, the mucous membrane becomes inflamed (*v.* Cervical Catarrh). The submucous tissue is also thickened and the whole cervix thus hypertrophied. With these inflammatory changes there is *eversion* of the lips of the cervix. Emmet formerly explained its occurrence on purely mechanical principles—that the weight of the uterus pressed the cervix against the posterior vaginal wall,

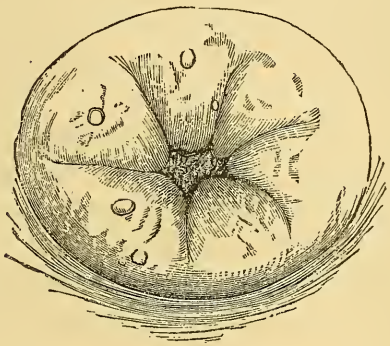

Fig. 174.

Multiple or stellate laceration (Emmet).

which flattened or "rolled out" the lips. In his most recent utterances, however, he has abandoned this theory.

This eversion is sometimes counteracted by the formation of cicatricial tissue in the cleft, which leads to approximation of its edges and even to its complete obliteration.

Other pathological conditions are often associated with lacerations. According to Emmet they are the result of it, though the causal connection is not obvious. Cellulitis is the most important of these ; frequently we find, on the same side as the laceration, a localised cellulitis in the shape of a distinct deposit, or a tense condition of the utero-sacral or broad ligament, accompanied with pain on pressure through the fornix. Subinvolution of the uterus is also frequently present ; there is a formation of cicatricial tissue, which compresses the blood-vessels and leads to passive congestion and hypertrophy.

Further, we find cylindrical epithelium covering the mucous membrane

beyond the limits of the os externum. The cylindrical apparently proliferates more rapidly than the squamous epithelium, and, replacing it, produces the appearance of an erosion (*v.* Cervical Catarrh, Chap. XXVIII.).

ETIOLOGY.

A laceration of the cervix will be found, according to Emmet's statistics, in 32.8 per cent. of parous women ; according to Mundé, in 30 per cent. Though it is obvious that lacerations may be produced and heal again so that all trace of them escape notice, we cannot affirm that the cervix is lacerated with every first full-time labour. When present, a laceration of the cervix (if we exclude the possibility of the cervix having been divided artificially) *is the most reliable diagnostic of a former parturition.*

Of the condition of the cervical tissues which predispose to laceration we at present know nothing. It is evident that an indurated cervix would, *cæteris paribus,* be made more liable to be torn than a flaccid one.

We should have expected that lacerations would be more readily produced in a rapid labour, in which the os had not time to dilate. Emmet and Pallen, however, have found that they are more commonly the result of tedious labours.

Barker and Mundé both draw attention to the fact that they are less common among the wealthy than among the poor. This is probably explained by the better care and longer rest in the puerperium which the former enjoy.

During pregnancy, according to Nieberding, slight fissuring of the cervix with ectropium is produced. He examined the cases admitted to the lying-in hospital at Wurzburg at three periods—during pregnancy, as shortly as possible after delivery, and on dismissal. Only in 26 per cent. of the primiparæ examined (thirty-eight cases) was the appearance of the cervix normal during pregnancy ; in all the others more or less ectropium was present. In 50 per cent. there were in addition small fissures, which made the os stellate or irregular in form.

SYMPTOMS.

It is very important to know what symptoms are referable to a lacerated cervix. Those who revel in operative treatment ascribe every

pathological condition in the uterus to lacerations, while others altogether deny that they have any pathological significance.

We advance the following considerations in regard to the symptoms:

1. Lacerations of the cervix in themselves produce no symptoms. Hemorrhage may arise at the time of production, but is not a symptom of the persistence of the laceration.

2. Other pathological conditions arise secondarily as the result of the laceration, of which the most important is cervical catarrh; cicatricial tissue in the cleft may produce reflex nervous symptoms.

3. Pathological conditions are frequently present along with the laceration, as cellulitis and subinvolution. These have each their own train of symptoms. We are not as yet in a position to say how these are related to lacerations.

We sometimes find a well-marked laceration by chance, as it were, the patient having had no symptoms referable to a pelvic cause.

Frequently she complains of *leucorrhœa* and symptoms common to pelvic or uterine inflammation. *Menstruation* is often irregular, increased in 50 per cent. According to Emmet's statistics, this is in many cases due to subinvolution. *Neuralgia* is sometimes present, which may show itself locally in excessive tenderness to touch at the seat of laceration and has been compared to the sensitiveness present in toothache. In other cases it has taken the form of neuralgic pain in the pelvis generally, or sympathetic neuralgia elsewhere. It may seem a very gratuitous assumption to ascribe neuralgia to this cause; we know, however, that neuralgia is the result of nerve-filaments being caught in the cicatrix of a stump; Emmet and others record cases in which persistent neuralgia disappeared on excision of the cicatricial plug in a lacerated cervix.

Cataleptic convulsions were present in an interesting case recorded by Sutton (Am. Gyn. Trans., 1880). The convulsions could be produced at will by pressing the finger into the angle of laceration, though they did not occur on any other manipulation of the cervix. They occurred spontaneously several times during the day. The excision of the cicatricial tissue by Emmet's operation effected a complete cure.

DIAGNOSIS.

This presents, in many cases, no difficulty.

The finger feels the indentation or fissuring of the vaginal portion. Sometimes the cervical canal is patulous, and admits the distal phalanx of

the finger easily. Difficulty in diagnosis arises when there is much eversion of the mucous membrane of the cervical canal with thickening of the cervical tissue ; the fissure is thus obliterated, because the circle of the os is not formed of the os externum but of a higher unfissured portion of the canal. This thickening and the velvety feeling of the everted mucous membrane lead us to suspect the condition.

The *speculum* clears up all uncertainty. We see a bright irregular patch on one side of or surrounding the os ; from its granular appearance, its vascularity, and the fact that it bleeds easily, it resembles an ulcerated surface. For this reason it is often described as "*ulceration*" of the cervix, but it is no more an ulceration than is the inflamed mucous membrane of the conjunctiva. By ulceration we understand a destruction and loss of tissue. The epithelium and subepithelial tissue may be destroyed as an immediate result of injury during labour ; but the raw-looking surface, appearing secondary to and also independent of lacerations (see Catarrh in Nulliparæ), is not an ulcerated surface, and should therefore not be treated as such.

For the appearance presented by the various forms of laceration when seen in the speculum, the student should compare Fig. 173 and Fig. 174. The difference between the colour of the everted cervical mucous membrane and that of the vagina is represented in Plate VIII., Figs. 1 and 2. A beautiful series of chromo-lithographs is appended to Mundé's article (Am. Jour. of Obst., Jan., 1879), which illustrates the various degrees of laceration. The most complete series is in Nieberding's pamphlet which gives representations of the cervix uteri before and after parturition, both in primiparæ and multiparæ ; the colouring, however, is unnatural.

The microscopic changes which produce the appearance simulating ulceration will be described under Cervical Catarrh.

The *tenacula* are a valuable adjunct in examination with the speculum. If we place one in the anterior and one in the posterior lip, and roll these in on one another, the raw-looking surface will in many cases disappear. This easily demonstrated fact had not been recognized till Emmet drew attention to it, and based on it the operation which will be always associated with his name. By thus rolling the lips inwards, we restore the laceration and see the extent of it so as to judge of the possibility of approximating the lips with sutures.

We need not remind the student that he must not be satisfied with finding a laceration of the cervix, however striking it may appear in the

speculum. The bimanual examination should be done with all the greater care, to ascertain that there is not also present cellulitis or subinvolution of the uterus.

TREATMENT.

Treatment, to be scientific, must be based on correct pathology. This, we think, is the strongest argument in favour of the reasonableness of Emmet's operation.

Like every new method in medicine and surgery, the operation has been performed in numbers of cases where it was not called for. After the student has been in practice he will find cases of chronic metritis (or subinvolution) and cellulitis the most difficult to treat; hence Emmet's operation was hailed in America by the weary and baffled gynecologist as the panacea for which he was waiting. This abuse of the operation in America is one reason why it is so slow in finding acceptance in this country. In Germany it has been taken up by Breisky, Spiegelburg, and others. Schroeder's operation for cervical catarrh is practically a bilateral Emmet's operation combined with excision of the cervical mucous membrane.

The stitching up of the laceration *immediately after parturition* was first performed by Pallen of New York. Having failed to check by the tampon post-partum hemorrhage from a lacerated cervix, he passed Sims' speculum and sewed up the laceration with silver-wire sutures; this checked the hemorrhage. We have never had occasion to perform the "immediate" operation; injections of very hot water have always sufficed to check hemorrhage. Considering the liability to septic inflammation in the puerperal condition, we would be very chary about operating unless the hemorrhage were considerable and not diminished by hot injections.

The paring of the edges of an old laceration and uniting of them with sutures, we shall call "Emmet's operation," a simpler and more suggestive name than "Trachelorraphy."

Indications for Emmet's Operation.—In the treatment of lacerations, as of many other uterine affections, skill may often be shown in knowing to leave the case alone rather than in operating. (See Lee's paper.)

We should not operate :—

1. When laceration, however well marked, has produced no symptoms.
2. Where chronic pelvic peritonitis or cellulitis is present.

As to the circumstances in which an operation is called for, Emmet

says, "in every instance where the condition is evident, and where enlargement of the uterus still remains, or where the woman suffers from neuralgia, I consider an operation necessary, notwithstanding the parts may have completely healed." As he ascribes sterility to laceration, he holds this also as an indication for his operation in certain cases. Secondary catarrh may prevent conception, but lacerations are so common in the fertile that we should not consider them a cause of sterility.

We recommend the operation in cases of pronounced eversion of the mucous membrane with cervical catarrh, with or without subinvolution. Subinvolution often disappears after the operation, but we cannot say that this is due to the closure of the laceration; involution is stimulated by every operation on the cervix (*v.* Chronic Metritis).

Preliminaries to the Operation.—The patient should use warm water injections for some weeks previous to the operation, and apply a blister if there be any indication of cellulitis. Emmet lays great stress on this preparatory treatment, and says that we should not operate so long as there is any tenderness on pressure in the fornices. He further recommends, in cases where the cervix is thickened and the mucous follicles enlarged, scarification of the cervix and painting with iodine or tannin and glycerine.

The Operation.—The following instruments are required:—

Vaginal douche,
Sims speculum,
Volsella,
Tenacula,
Rubber ring,
Bistoury and scissors,
Dissecting forceps,
Short needles (Fig. 112), straight and curved,
Needle-holder,
Medium silver wire.

The patient is placed under chloroform in the lithotomy posture (in the semiprone posture by Emmet, but this does not give the operator so much room); the sacral segment is drawn back with the speculum by an assistant, and the cervix is laid hold of with the volsella and drawn down. Draw the edges of the laceration together with the tenacula to see how much tissue must be pared from the edges of the cleft to allow it to be sewed up, and then proceed to operate. Slip the rubber ring over the

volsella on to the cervix and place it so as to constrict the base; this prevents bleeding and thus allows the operator to see that the edges are completely pared, which is essential to union of the raw surfaces. Wash out

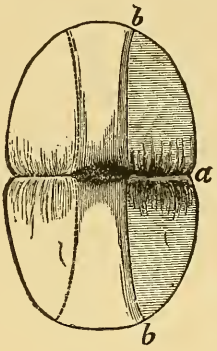

Fig. 175.

Operation for lacerated cervix; *a b*, extent of denuded surface.

the vagina with carbolised water. When possible, continual irrigation is kept up during the operation; with this, the india-rubber ring is not required, as the stream of water keeps the denuded surface always clean. Now pare the edges of the laceration with the scissors or knife (Fig. 175);

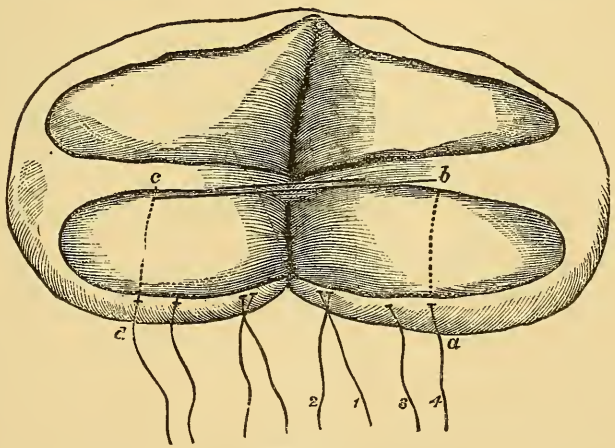

Fig. 176.

Extent of denuded surface and course of sutures according to Emmet (Emmet). The sutures are passed in order 1, 2, 3, 4; the course of suture 4 alone is indicated by letters *a*, *b*, *c*, *d*.

scissors are preferable, because they cut with greater ease and rapidity. With long-bladed scissors we can remove the tissue from one edge of the laceration with a steady clean cut right into the angle; Emmet lays great

stress on the removal of the cicatricial tissue in the angle, but uses the bistoury to do this. When the laceration is bilateral this must be done on both sides. Fig. 176 shows the extent of surface denuded by Emmet in

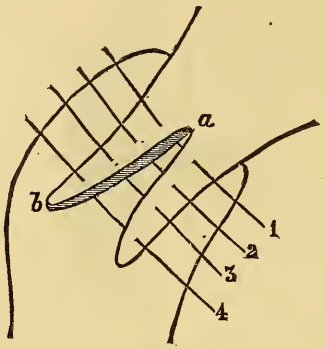

Fig. 177.

Mode of passing sutures; *a*, *b*, denuded surface as in Fig. 175. The sutures are passed in order as numbered.

a case of bilateral laceration. Great care must be taken to leave a broad strip (broader than represented in Fig. 176) undenuded in the middle line to form the walls of the cervical canal. Now introduce the sutures; these

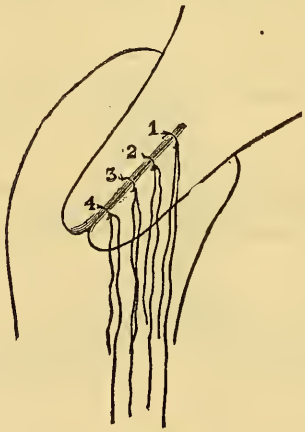

Fig. 178.

Appearance of cervix when sutures twisted up. They are left long so as to extend to vaginal orifice and are removed in order as numbered.

are about eight inches long, so that both ends protrude from the vagina, and are well adapted to the eye of the needle so as not to obstruct its passage. Emmet recommends the round needle, as it makes a smaller hole and is therefore followed by less hemorrhage; when the tissues are dense,

the lance-shaped point perforates more easily. Pass the sutures as in Fig. 177, beginning at the upper part of the wound: each is drawn half through but is not twisted up till its fellows are in position, as it is sometimes necessary (when the tissues are thick) to pass the needle first through one lip and then through the other; they are then twisted up; the ends are brought out at the vaginal orifice, tied together, and wrapped round with a piece of wadding (Fig. 178).

Emmet cuts the sutures short, but the long ends facilitate their removal. No special regimen is required afterwards, the diet need not be restricted.

Removal of Sutures.—The stitches are removed on the seventh or eighth day. To do this we require speculum, wire-scissors, rake and forceps. The rake is almost indispensable in removing sutures from the cervix or vagina; it is represented and described at Fig. 168. The sutures are removed *from above downwards;* if we reverse the order, we may tear the lower portion apart in removing the upper sutures; if the surfaces have not entirely united, the lower sutures should be left in for a few days longer.

The cicatrix does not cause difficulty in subsequent parturitions.

CHAPTER XXVIII.

CHRONIC CERVICAL CATARRH.

LITERATURE.

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Acute catarrh of the cervix is known to us only as part of a general catarrh affecting both body and cervix, and will be described under Acute Endometritis.

Chronic catarrh occurs localised in the cervical mucous membrane; it is a very common condition and one of the most troublesome which the practitioner has to treat.

PATHOLOGY.

The mucous membrane of the cervical canal is inflamed. When the os externum has been lacerated, the lips gape and the mucous membrane is thus everted; on bringing the margins of the laceration together, this eversion will disappear. Further, there are granular patches with irregular outline which extend beyond the limits of the os externum; these have a red appearance similar to the cervical mucous membrane, and therefore are sharply defined from the paler mucous membrane which covers the vaginal portion of the cervix.

This last condition was till late years generally held to be an "ulceration," and is still described, even in recent English works, under that name. The term should, however, be discarded as based on an erroneous pathology and suggesting most pernicious treatment. The cause of the error is easily explained; a raw-looking granular surface was seen in the speculum: the raw appearance was ascribed to the loss of the epithelium, and this supposition was supported by the microscopic examination of specimens taken from the dead body, in which the epithelium had been macerated and removed; the granular points were supposed to be the subjacent papillæ which had become hypertrophied.

Both of these suppositions have been shown to be erroneous by the careful investigations of Ruge and Veit, who examined specimens of the

Fig. 179.

Papillary form of erosion (Schroeder).

so-called ulcerations cut fresh from the living subject; they demonstrated (1) that the apparently raw surface is covered with epithelium, (2) that the granular points are new formations and have no connection with the papillæ of the mucous membrane.

The microscopic appearance of the mucous membrane described by them is as follows: The surface is covered with a single layer of epithelium; the cells are smaller than those which line the normal cervical canal, and being narrow and long have a palisade-like arrangement; the thin layer of cells allow the subjacent vascular tissue to shine through, hence the *redness* of color. The surface is further thrown into numerous folds producing glandular recesses and processes; these processes cause the *granular* appearance of the surface. This condition is well seen in Plate VIII., and constitutes the *simple* erosion: Fig. 1 shows such an erosion as seen in the speculum: Fig. 3 shows a microscopic section of the same, stained with carmine; the left half of the section corresponds to

the deep red portion of Fig. 1, the right half to the paler portion outside of this. If the recesses be long and narrow, the surface is split up into distinct papillæ ; this constitutes the *papillary* erosion (see Fig. 179). If the ducts of the glandular recesses become obliterated, the secretion will distend the gland below and produce retention-cysts ; these will increase in size, and may come to the surface and burst. Thus there is formed the *follicular* erosion (see Fig. 180).

The raw-looking surface is therefore *a newly formed glandular secreting surface*, resembling in structure the cervical mucous membrane. This addition to the extent of secreting surface increases the leucorrhœal discharge which is the leading symptom.

These observations of Ruge and Veit have been confirmed in their essential points by Fischel and other observers ; Fischel considers the secreting processes, while being new formations, to have the structure of papillæ and not to be mere foldings of the mucous membrane.

While there is, therefore, no disagreement as to the microscopical appearance of the so-called "ulcerations," the *origin* of this new epithelial structure is disputed. Ruge and Veit hold that this single layer of small

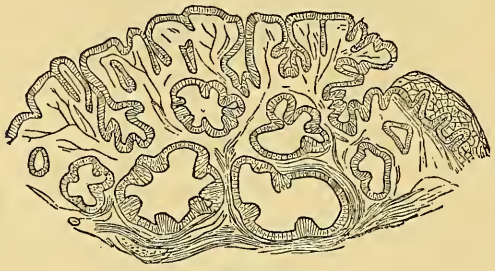


Fig. 180.

Follicular form of erosion (Schroeder).

cylindrical cells is produced by proliferation of the cells of the *deepest layer of the rete Malpighi*, while those of the superficial layer are shelled off ; the appearance seen in Fig. 180 favours this view. It will be observed also that they regard the simple follicular and papillary "ulcerations" as the results of one and the same process, viz., proliferation of epithelial cells. On the other hand, those red patches are generally continuous with the mucous membrane of the cervical canal and resemble it in their microscopic structure ; it is therefore much more probable that they are occasioned by proliferation of the *epithelium which lines the cervical glands*, leading to an extension of the glandular surface beyond the os externum.

Fischel holds that there is not only the proliferation of epithelial cells, but of connective tissue ; and that, according to the preponderance of the one over the other, the follicular or papillary forms are produced.

This description of the microscopic changes makes it evident that the process is not one of "ulceration;" and this term should, therefore, be abandoned. "Ectropium" or "Eversion of the mucous membrane" describes the condition in its relation to laceration, but does not describe the extension of the secreting surface beyond the os externum ; the term is preferable to "ulceration," as, at least, it is not misleading. Thomas describes these conditions under the name of "Granular and Cystic Degeneration of the Cervix Uteri." This term is based on the naked eye *appearance* of the cervix, and conveys no idea as to the pathological change which takes place. Under granular degeneration, he describes the papillary form ; under cystic degeneration, the follicular. As we are not in a

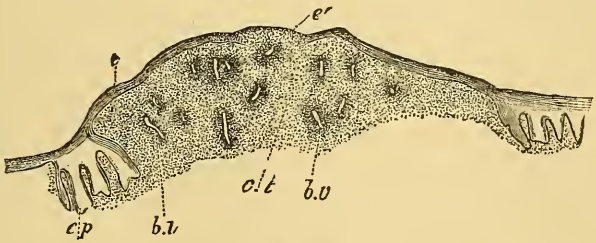


Fig. 181.

True ulceration of the cervix. At the sides of diagram is seen the normal epithelium, which is prolonged in processes, *e p*, between the connective tissue papillæ; *e*, is superficial layer of squamous epithelium reduced to a thin layer at *e'*; *c t*, tissue of mucosa infiltrated with small cells; *b v*, blood-vessels surrounded by small-celled infiltration. (Fischel.)

position to introduce a term based on pathology, it is preferable to designate it according to its symptom as Cervical Catarrh. The red patches which lie outside the os externum we shall speak of as "*catarrhal patches.*"

Sometimes a true ulcerated process—destruction of epithelium with inflammation of connective tissue—does occur ; such a condition is represented in Fig. 181.

Along with those changes in the mucous membrane, chronic inflammatory changes occur in the other tissues of the cervix. There is increased formation of connective tissue, which produces antero-posterior thickening, and sometimes elongation. The secretion in the obstructed glands becomes inspissated, and hence the retention cysts are felt as firm pea-like

bodies—Ovula Nabothii—in the substance of the cervix or projecting from it; or their contents may suppurate and form small abscesses. As there are no racemose glands on the vaginal portion beyond the limits of the os externum (see Histology of Normal Cervix, p. 19), these ovula Nabothii must be produced from the glands of the mucous membrane of the cervical canal or from the newly formed glandular tissue. Fritsch draws attention to the fact that the glands of the cervix are enormously hypertrophied during pregnancy, so that the cervix becomes almost a glandular organ; the persistence of this condition after the puerperium may explain the increased glandular formation which is described above as the chief pathological element in cervical catarrh.

Sometimes we find a single large cyst in the cervix, due to obstruction of the mucous glands. When it is in the substance of the wall, the soft bulging into the cervical canal and the accompanying menorrhagia may lead one to suspect commencing sarcomatous infiltration. Puncturing with a trocar removes a clear or straw-coloured fluid, rich in mucous corpuscles. We have seen a cyst of such a size as to cause serious obstruction to labor in a woman who had had a succession of uncomplicated labours.

The microscopic pathology of the cervix has only of recent years been carefully investigated, and there are many points on which definite information has not as yet been obtained. The following is a brief summary of the pathological changes described, which are best understood by comparison with the microscopic structure of the normal vaginal portion.

Normal Condition.—The vaginal portion is covered on its vaginal surface with many layers of squamous epithelium, resting on papillæ of connective tissue; there are no mucous follicles. The cervical canal is lined with a *single layer* of *cubical* epithelium (ciliated only on the free surface), folded so as to form shallow recesses which do not branch; there are *racemose mucous glands*, which have branching ducts. The substance of the cervix is made up of *connective* tissue.

Pathological Changes.—These, according to the extent and duration of the process, affect the three elements—epithelium, glands, connective tissue.

The *epithelium* of the cervical canal may be simply exposed (ectropium after laceration), or it may be inflamed. When inflamed, the folding of the mucous membrane is greatly increased so that the surface has a papillary or granular appearance. Further, this inflamed mucous surface may

be found extending beyond its normal limit (the os externum) in the form of red patches (catarrhal patches) which are smooth or granular.

The *glands* hypertrophy, and new glands form as the result of the proliferation of epithelium described above. The openings of the glands are at first restricted to the area covered with a single layer of cubical epithelium, but their branching ends extend below the limiting surface of stratified squamous epithelium. Their ducts become obstructed, and retention cysts form not only on the red patches but also underneath the adjacent apparently normal vaginal mucous membrane. They may remain as little nodules in the mucous membrane, or may come to the surface and burst; in the latter case the cubical epithelium and papillæ on the inner wall of the cyst are exposed and, being now on a free surface, proliferate. When the glands are the special seat of the pathological changes, the whole substance of the cervix is converted into a cystic mass.

The *connective tissue* always increases in amount, specially when the process is chronic. This increase constitutes the "areolar hyperplasia" of Thomas.

ETIOLOGY.

The most important cause is, undoubtedly, the injury of the cervix produced in *parturition;* hence cervical catarrh is common in parous women. How this injury produces the inflammatory condition is a disputed point. Emmet refers it immediately to the laceration, and holds that the exposure of the mucous membrane to friction against the vaginal walls leads to irritation and inflammation; but we frequently see cases of well-marked lacerations without consequent cervical catarrh. It is admitted by all that the existence of lacerations greatly favours the development of catarrh.

Other less important causes are the *spread of inflammation* from the vagina *upwards* (vaginitis, which may be simple or gonorrhœal), and from the endometrium *downwards.* The latter is favored by the fact that the discharges from the endometrium necessarily flow over the cervix and irritate it.

Cervical catarrh is the most frequent complication of retroflexion of the uterus. The flexion favours gaping of the lacerated cervix and produces passive congestion of the cervical tissues.

SYMPTOMS.

These are—Leucorrhœa;
Pain in back and loins, increased on exercise;
Irregular menstruation;
Sterility.

Leucorrhœa is the prominent symptom. Under normal conditions the secretion from the mucous membrane of the uterus and cervix is not sufficient to attract attention; when it is excessive, it is termed leucorrhœa (λευκός, white, ῥέω, to flow), or in popular language "whites." A transient leucorrhœa from the cervix and uterus occurs before and after the menstrual flow; this is a hyper-secretion due to temporary congestion.

The secretion from the glands of the cervical canal is clear and viscid, resembling unboiled white of egg. It becomes of an opaque white when mucous corpuscles are abundant, yellowish when pus corpuscles are present. Frequently, it is tinged with blood from the blood-vessels of the newly formed vascular tissue.

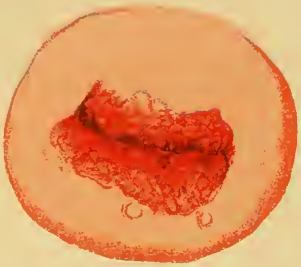
Pain in the back and loins is present, as in all uterine disease. It is aggravated on active exercise, such as walking and riding, or whatever causes friction of the cervix against the vaginal walls. Pain on coitus is sometimes present.

Menstruation is irregular, and often increased in quantity; this is probably due to extension of inflammation upwards to the endometrium. We must take care not to mistake leucorrhœa tinged with blood for the regular menstrual flow.

Sterility is often present. In nulliparæ with a small os externum, the plug of mucous in the cervical canal is often an effectual bar to conception. In multiparæ, we have seen conception take place even though there was a deep laceration and well-marked catarrh; the presence of catarrh, however, though not an obstacle to conception, greatly diminishes its probability.

PHYSICAL SIGNS.

On *vaginal examination*, the condition of the cervix is found to vary according as the patient is nulliparous or multiparous and the disease of long or short duration. In a nullipara, the cervix feels puffy and large, the margins of the os soft and velvety (when there is eversion with extension of catarrhal area beyond the os externum); or the os and cervix



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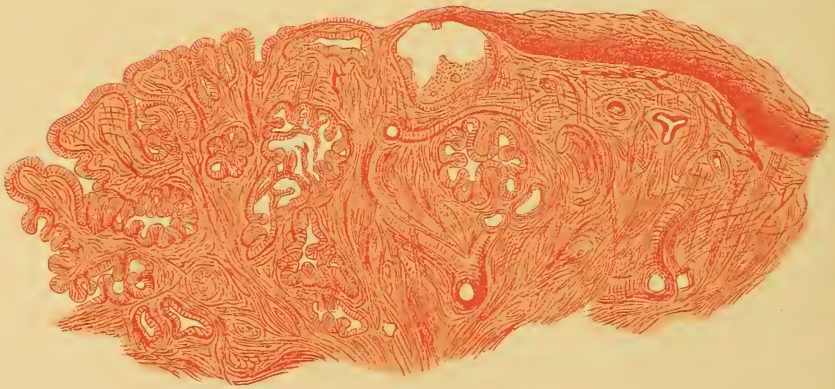

3

EROSION AND LACERATION OF CERVIX (RUGE AND VEIT).

H. BENCKE LITH. N.Y.

are apparently normal but movement causes pain (when the catarrhal area does not extend beyond the os externum). In a multipara, the existence of a laceration must first be determined and the extent of it noted; the margins of the os are soft and velvety, and pea-like nodules (Nabothian follicles) are felt on and sometimes round them; polypoidal projections may be present and, more rarely, the cervix is converted into a mass of cysts; the os is usually gaping so that the finger can be passed into the cervical canal, where the mucous membrane has an irregular surface and is often thrown into longitudinal ridges.

The *speculum* is now employed; its use must always be preceded by a careful examination with the finger to ascertain, when laceration is present, the undisturbed relations of the lips of the cervix. Neither finger nor speculum alone is sufficient, we must employ both, and learn to associate what is felt by the finger (*e.g.*, lacerations, velvety mucous membrane, pea-like follicles) with what is seen with the speculum. The superiority of the Sims speculum for examination is very marked, as it exposes the lip of the cervix without disturbing the relations.

In a nullipara, we see the os apparently normal but with a tenacious plug of mucus projecting through it; or there may be red catarrhal patches such as are represented in Plate VIII., Fig. 1, which shows very well the contrast between the appearance of these patches and the surrounding mucous membrane; no chromo-lithograph, however, perfectly displays the natural colours.

In a multipara, a laceration is sometimes evident. Oftener it escapes recognition; the os appears to be wide and unfissured, while on both lips there is a red velvety surface (Plate VIII., Fig. 2); if, now, tenacula be fixed in the gaping lips and these rolled in on one another, the red surfaces will disappear and a bilateral laceration become evident. Sometimes white cicatricial tissue indicates the situation of the laceration. Though the lips are thus approximated, a red surface is often visible because the catarrhal area has spread beyond the os externum. The obstructed Nabothian follicles appear as bluish-red projections from the mucous membrane; occasionally they appear as small polypi.

DIAGNOSIS AND DIFFERENTIAL DIAGNOSIS.

The diagnosis between cervical and vaginal catarrh is made clear by using the speculum, for we see in the former case the leucorrhœa coming

from the cervix and having the character above described. Should the discharge not be profuse enough to be seen with the speculum, we may employ the method recommended by Schultz for diagnosing between uterine and vaginal catarrh. The vagina is washed out in the evening, and a tampon soaked in a solution of tannin is placed against the os externum ; in the morning the tampon is removed through the speculum, and we note the quantity and character of the discharge which has accumulated above it.

The diagnosis between cervical catarrh and endometritis is difficult, and in many cases cannot be made ; when cervical catarrh is present, we cannot be positive that there is not some endometritis as well. Increase in the length of the uterine cavity (especially with tenderness or irregularities of the mucous membrane), ascertained by the sound, indicates endometritis. When the cervix is much thickened and indurated, we may suspect the commencement of malignant disease ; this will be considered under Carcinoma of the Cervix.

PROGNOSIS.

In this we must consider the constitutional health of the patient, the duration of the symptoms, and the extent to which the tissues are affected. According to Thomas, the prognosis is less favourable when there is considerable secretion of mucus with little apparent "granular degeneration." The practitioner will often find that cases of cervical catarrh have already passed through several hands, and he should therefore be on his guard in offering hopes of speedy cure.

TREATMENT.

In the first place, special attention must be given to the patient's *general health ;* if we trust to local treatment alone, we shall often be disappointed. We should recommend change of air and light nourishing food. A certain amount of exercise is valuable ; but too much of it, specially of riding, is injurious. Tonics (such as arsenic, quinine, and iron) are useful. Disturbances of the digestive system, which are frequent in chronic cases, must be treated as each case indicates. Complete rest from sexual activity is advisable ; this can often be secured by recommending that the patient go away from home for a time.

Cervical catarrh is in some cases only a local manifestation of a constitutional state such as tuberculosis or anæmia.

The *local treatment* varies according as the patient is nulliparous or multiparous. In both cases we must be prepared to carry out a system of treatment which lasts for weeks.

1. *In nulliparæ* we begin with a course of vaginal injections of warm water. They are used freely, from ten minutes to a quarter of an hour, every night. To the simple water, sulphate of zinc (3 j. to the pint), sulphate of alumina or sulphate of copper (3 ij. to the pint) may be added.

If the os be narrow, as it usually is, it is good to notch it bilaterally with the scissors. This acts beneficially in three ways—by allowing the mucus to escape freely, by opening up the canal so as to allow of further applications, by favouring the occurrence of pregnancy.

When catarrhal patches are present round the os, or when we find that the secretion continues copious in spite of the frequent injections, we must make a local application to the mucous membrane. Of applications the best are iodine (the tincture or the strong liniment) and carbolic acid, the former in milder and the latter in more severe cases. The liquor hydrargyri pernitratis is recommended by Heywood Smith, and chromic acid

Fig. 182.

Forceps dressed with cotton wadding.

is much praised by de Sinéty. In making these applications we proceed as follows: the mucus, which would prevent the action of the medicament on the mucous membrane, is first thoroughly removed by the forceps dressed with cotton-wool, as represented at Fig. 182. A second pair of forceps, covered merely with a film of cotton wadding, is now dipped in the medicament and applied to the surface. Should the canal be narrow, a sound dressed as for endometric applications (see Fig. 190) is preferable. Care is taken that there be no free drop of the solution on the cotton-wool, which might fall on the vaginal mucous membrane; after the application is made, a jet of water is thrown on the cervix to wash off any superfluous acid and a pledget of cotton wadding with glycerine is placed below the cervix.

Rarely in nulliparæ is the pathological process so extensive as to require operative means for removing cervical tissue.

2. *In Multiparæ.*—Here the cervical catarrh is usually associated with

other conditions—retroflexion, subinvolution, and, especially, marked laceration of the cervix. The first treatment indicated is to diminish the passive congestion of the cervix by hot water injections and the use of the glycerine plug. The latter is prepared as already described (p. 196), and should be renewed daily. The patient can introduce it herself with Barnes' speculum (Fig. 183). A simpler means is to draw the string through a piece of glass tubing, and to keep it taut with the finger on the end of the tube till the plug is carried into the roof of the vagina; then the finger is removed and the tube is slipped out over the string. If the uterus be retroflexed, it should be replaced and kept in position by a pessary. Even where it is not displaced, a pessary is often useful in lifting the uterus upwards in the pelvis and diminishing passive congestion. In cases where there is a distinct laceration of the cervix, and specially where the catarrhal

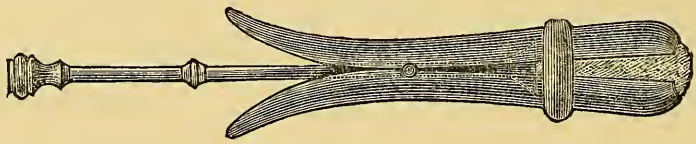

Fig. 183.

Barnes' speculum for introduction of medicated cotton-wool into the vagina (Barnes).

patches can be made to disappear by rolling the lips inwards on each other, Emmet's operation is indicated.

Local depletion by scarification or leeches was formerly much employed, but is going out; its effects are only transitory. Scarification is done best through the Fergusson speculum, and with a lancet-shaped bistoury; a number of small punctures are made, from a quarter to half-an-inch in depth. Leeches are applied as follows: Fergusson's speculum is passed; a pledget of lint, with string attached, is placed in the cervical canal to prevent their crawling upwards into the uterine cavity; a little blood is drawn by superficial scratches and three or four leeches thrown into the speculum, and pushed up towards the cervix with a pledget of cotton wadding. We must watch the speculum lest the leeches slip out; after the speculum and leeches are removed, the vagina is douched with a tepid injection of carbolised water.

Scarification is, however, useful for another object. When there are hard knobby retention cysts producing irritation by the pressure of their contents, the puncturing of these diminishes the chronic inflammation. When these cysts project as small polypi, they are easily snipped off.

In very chronic cases, the only remedy is the destruction of the diseased glandular tissue—just as in tonsillitis we excise the tonsils. This has been done by the application of strong nitric acid or the cautery; but the use of the curette or knife is a much more effective and safe method than any process of cauterisation. Thomas commends the steel curette for the removal of the diseased glands; it is applied "so forcibly as to remove the arbor vitæ and mucous glands from the os internum to the os externum. Sometimes a second operation in two or three weeks after the first has been necessary, and sometimes even a third."

Schroeder uses the knife, and operates as follows. The cervix is laid

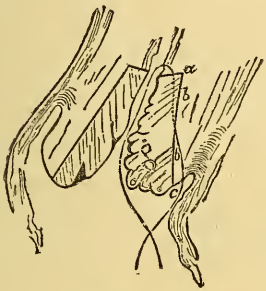

Fig. 184.

Fig. 185.

Schroeder's excision of the cervical mucous membrane in cervical catarrh. Fig. 184, line of incision in mucous membrane. Fig. 185, mucous membrane excised and flap *b c*, turned in on *a b* (Schroeder).

hold of with two volsella, one on each lip, and drawn downwards. It is divided laterally as far as the fornix with the scissors, so as to form an anterior and a posterior lip, which are separate as far as the vaginal roof (Fig. 184). A transverse incision (seen in section, at *a*, Fig. 185) is made across the base of the anterior lip, dividing the whole thickness of the cervical mucous membrane. He next pieces the point of the lip at *c*, pushing the knife in the direction *b b* till it reaches the cross incision *a*; he carries the blade outwards first to one side and then to the other, so that all outside of the line *a b c* is cut away. The flap of cervix is now turned in, and stitched as in Fig. 185. The advantage claimed for this method of operating is that the degenerated cervical mucous membrane is replaced by vaginal mucous membrane, which shows no tendency to degenerate. Schroeder has operated thus more than three hundred and fifty times (two deaths), and with very good results as to the cure of the catarrh.

CHAPTER XXIX.

ENDOMETRITIS.

LITERATURE.

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Inflammatory action may affect the peritoneal covering, the muscular substance, or the mucous membrane of the uterus, producing *perimetritis, metritis,* or *endometritis.* Usually we find more than one of these conditions present at once, as the inflammatory action is rarely limited to one of these coats. Perimetritis is only a part of pelvic peritonitis, under which head it has already been considered.

We now consider inflammation limited to the mucous membrane of the uterus—endometritis, which may be acute or chronic.

Definition.—Inflammation of the mucous membrane of the uterus.

Synonyms.—Uterine catarrh, internal metritis.

PATHOLOGY.

In *acute endometritis* both body and cervix are involved, and usually the underlying muscular coat also. The mucous membrane is swollen and

soft, and covered with red stained mucus or creamy pus. Extravasations of blood are present as red streaks or patches. These changes are not so marked in the cervical mucous membrane as in that of the body ; the vaginal portion has the same appearance as during pregnancy, being soft and swollen and showing round the os red catarrhal patches.

The ciliated epithelium is destroyed, and sometimes casts of the epithelium of the glands are found in the discharge (Schroeder). The secretion is at first serous, then purulent.

In *chronic endometritis*, the mucous membrane is hypertrophied and marked with patches of old extravasation.

The microscopic appearances vary with the structures which are principally affected. Our knowledge upon this subject is principally derived from the examination of the portion of mucous membrane removed by the curette. We can distinguish three pathological types according to the tis-

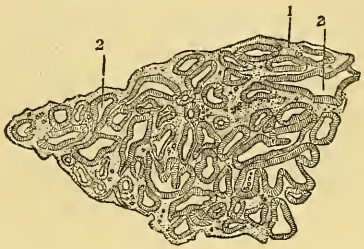

Fig. 186.

Cross section of a granulation in a case of endometritis $^{40}/_{1}$. 1, Stroma ; 2, dilated glands (De Sinéty).

sue chiefly involved. In the first, the glands are hypertrophied ; in the second, the vessels are dilated and enlarged ; in the third, an undifferentiated embryonic tissue is produced. We must remember, however, that in no case is one structure alone affected ; there is no hard and fast line between the different processes. For the following description we are indebted to the researches of Olshausen, Carl Ruge, and De Sinéty.

According to Schroeder's clinical observations, the microscopic investigation of which has been made by Ruge, the most frequent condition is a hypertrophy of the glands. In some cases they are so much hypertrophied that the granulations appear as masses of glandular tissue, as is well shown by the accompanying figure from De Sinéty (186). In such a condition, the chief symptom is leucorrhœa.

Olshausen has described very carefully the changes of the mucous membrane in cases of the second type, in which the only symptom is hemorrhage. The mucous membrane is hypertrophied to three or four times its

normal thickness. It is elevated through its whole extent in a soft cushion-like swelling, or in more localised spongy masses; the hypertrophy does not extend beyond the os internum to the cervix, and thus resembles in its situation a decidual membrane. The portions removed by the curette are unusually thick; one side presents a smooth rose-coloured surface which resembles the appearance of the mucous membrane of the intestine, and the other has a deep red, raw surface. "The microscopic examination of these scrapings," Olshausen says, "shows that there is great hypertrophy of the mucous membrane with increase of all its elements—moderate dilatation of the lumina of the glands, enlargement of the blood-vessels, and marked cellular infiltration of the connective tissue" (Fig. 187). The characteristics of this type are, that the glands do not become enlarged so as to produce cystic dilatations, and

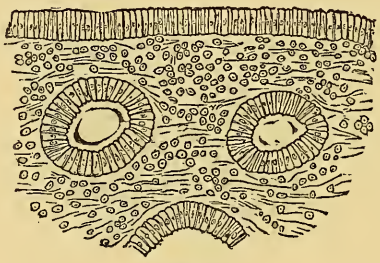

Fig. 187.

Vascular type of endometritis—endometritis fungosa (Olshausen).

that the blood-vessels are greatly distended: the latter fact explains the hemorrhage which is the chief symptom. The absence of the increased leucorrhœal discharge, so characteristic of the polypoidal form, is probably due to the fact that the glands are not markedly affected. De Sinéty gives a figure which shows the dilatation of the blood-vessels in this vascular type of endometritis (Fig. 188).

The third type is described only by De Sinéty. "In other cases," he says, "the vegetations are specially constituted of embryonic tissue with few blood-vessels. There are only traces of the glands and some remains of more or less degenerated epithelium. We have to do with a truly inflammatory tissue comparable to that which forms upon an exposed wound. At certain points there are islands of degenerated elements which are not colored by reagents and are analogous to those observed in foci producing pus. This degeneration of embryonic elements explains to

us the abundance of the muco-purulent discharge observed during life" (Fig. 189).

When chronic endometritis has persisted for a long time, the mucous membrane becomes atrophied: the ciliated and afterwards the cylindrical

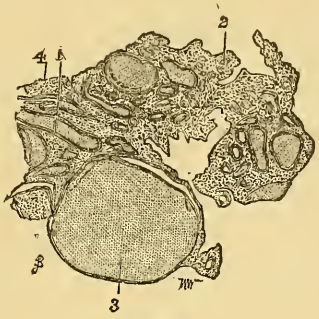

Fig. 188.

Cross section of granulation composed of dilated vessels in a case of endometritis $^{40}/_{1}$. 1, vessels cut longitudinally; 2, vessels cut transversely; 3, dilated vessel filled with blood-corpuscles; 4, embryonic tissue (De Sinéty).

epithelium is lost, and small polymorphous cells resembling squamous epithelium take their place; finally, the mucous membrane disappears altogether and the uterine cavity comes to be lined with a layer of connective tissue. The glands fall out so that the mucous membrane

Fig. 189.

Cross section of granulation composed of embryonic elements, from a case of endometritis $^{40}/_{1}$. 1, embryonic tissue; 2, part undergoing fatty degeneration (De Sinéty).

becomes mesh-like, or they are constricted to form retention cysts (Schroeder).

Senile atresia of the cervical canal is the result of a localised chronic endometritis. This is one of the physiological changes which occur after the menopause. In some cases, however, it becomes pathological; accumulation of mucus, more rarely of blood, takes place above the obstruction and produces the changes of endometritis.

Routh describes a form of endometritis in which the inflammatory process is limited to the fundus uteri—the area between the orifices of the Fallopian tubes; his description is, however, based on clinical observation rather than pathological data.

ETIOLOGY.

Acute endometritis is a rare condition, and never occurs before puberty. It comes on most frequently in connection with menstruation, when the physiological congestion readily passes into inflammation. It is occasioned by exposure to cold or sexual excess at the periods, and by the extension of gonorrhœal inflammation from the mucous membrane of the vagina. It also occurs in the exanthemata, typhus, scarlet fever, and measles; it has further been observed in cholera (Slavjansky), and in certain cases of phosphorus poisoning. In puerperal inflammation, endometritis is of course present.

Chronic endometritis is occasionally the result of acute; most frequently, however, it arises independently. Sometimes it is merely the indication of the constitutional state; in scrofulous and chlorotic cases, the normal leucorrhœa (which precedes and follows menstruation) is increased in quantity and prolonged during the intermenstrual period. This is due to hypersecretion rather than to inflammation. Increased leucorrhœa, with diminished menstrual flow, is quite characteristic in phthisis.

Chronic endometritis arises independently from the following causes:—

Parturition, especially when the uterus has not been completely emptied;

Exposure to cold during menstruation;

Obstruction to the menstrual flow;

Uterine displacements, especially retroflexion and prolapsus;

Polypi or other tumours in the uterine cavity;

Direct injury through incautious use of sound or tent;

Excessive sexual activity;

Extension of gonorrhœal or simple inflammation from vagina and cervix.

Of these the most important are *parturition* and *displacements*.

As regards parturition, endometritis is frequent after abortion; usually this is due to the patient's rising too soon, or to the incomplete emptying of the uterus. After full-time labour, the seat of the placenta seems to be in many cases the starting-point of the inflammatory process.

In nulliparæ with a narrow os externum causing obstruction to the menstrual flow, we frequently find the uterine cavity increased in length and endometritis present.

Uterine displacements do not necessarily produce endometritis. We sometimes find a retroversion or retroflexion which has produced no symptoms. As a rule chronic inflammation of the endometrium, as well as of the muscular coat, results from passive congestion.

SYMPTOMS.

A. Of Acute Endometritis.

These are fever more or less severe according to the inflammation, pain in the back and lower part of the abdomen with the sensation of weight in the pelvis, and in severe cases vesical and rectal tenesmus. The characteristic symptom is the discharge, which is at first clear and watery, but after a few days becomes creamy and purulent. The menstrual flow is sometimes suppressed, rarely is it increased.

B. Of Chronic Endometritis.

The leading symptoms are the following:

Leucorrhœa;
Menorrhagia;
Dysmenorrhœa;
Weakness in the back;
Pain in pelvis and loins;
Digestive derangements;
Nervous derangements:
Sterility;
Abortion.

Leucorrhœa is the characteristic symptom. The secretion from the body of the uterus is of a watery character, less dense and gelatinous than that from the cervix; usually, however, there is cervical catarrh as well. The uterine secretion has an alkaline reaction, while vaginal leucorrhœa is acid. Sometimes it is tinged with blood, producing an appearance which Bennet aptly compares to the rust-colored sputum in pneumonia. This blood-stained leucorrhœa must not be confounded with the men-

strual flow. In some cases the discharge is purulent, accumulates in the uterine cavity, and is only discharged at intervals.

Menorrhagia is frequently present. In one class of cases (see Pathology) it is the leading symptom, and is grave from the anæmia which it produces. It shows itself first in increased duration of the menstrual flow, which becomes gradually prolonged over the inter-menstrual period till the loss of blood becomes continuous. *Dysmenorrhœa* is frequently present, but is more probably due to complications (*e.g.*, flexions or chronic metritis) than to the condition of the mucous membrane. Membranous dysmenorrhœa (accompanied with exfoliation of the mucous membrane at the menstrual period) might be considered here, as its pathology is most nearly allied to endometritis; from its peculiar symptoms, however, it is better to consider it in the chapter on Dysmenorrhœa (Section VIII.).

"Weakness in the back" is the common complaint made by the patient. It may amount to actual pain, but more generally it shows itself as feebleness or weariness which incapacitates the patient for her daily work.

Derangements of the digestive and nervous systems invariably follow when the disease has become chronic. There is impaired digestion with loss of appetite and, as the result, general debility. Whether these are due to the drain of the system produced by the leucorrhœa or to the close connection between the nervous centres for the sexual organs and those for the digestive apparatus, we do not know. Derangements of the nervous system show themselves in frontal headache and depression of spirits amounting sometimes to melancholia.

Anœmia, with its characteristic train of symptoms, is the leading symptom in the hemorrhagic type (Olshausen).

Sterility is frequently present, and has been in certain cases the only symptom complained of. The secretion may destroy spermatozoa, may mechanically prevent them from passing upwards, or the villi of the fertilised ovum may be prevented from finding an attachment in the diseased mucous membrane. Again, the ovum is attached for a time but, from the imperfect formation of the uterine portion of the placenta, *abortion* takes place; repeated abortion is characteristic in chronic endometritis. A vicious circle is thus produced: as mentioned under etiology, endometritis frequently follows abortion; abortion, in its turn, frequently follows endometritis.

PHYSICAL SIGNS.

A. Of Acute Endometritis.

There is tenderness on pressure over the lower part of the abdomen, due to peritonitis which generally accompanies the acute form. On vaginal examination the cervix is found to be swollen and puffy, the os is dilated and feels velvety from eversion of the mucous membrane, the bimanual is unsatisfactory from sensitiveness to pressure. The speculum shows the vaginal portion to be congested, with catarrhal patches round the os and the follicles enlarged and sometimes containing pus. The leucorrhœal discharge already described is seen coming from the os uteri. The sound should not be used, as its introduction causes pain and sometimes hemorrhage.

B. Of Chronic Endometritis.

Tenderness on pressure is not necessarily present, though we frequently find it as the result of complications—peritonitis, cellulitis, ovaritis.

On vaginal examination the vaginal portion of the cervix is normal, or has the characters described under cervical catarrh. The bimanual shows the uterus to be *enlarged;* it is soft and flabby so that its form cannot easily be made out, or of a firm consistence from chronic metritis.

The sound passes *beyond* the 2½-inch knob to a varying extent, and on withdrawal is frequently tinged with blood. Its introduction may be difficult from irregularities in the mucous membrane, and is sometimes painful. In some cases pain is complained of when the sound touches the fundus of the uterus, which some consider characteristic of endometritis. Routh has described a variety of the disease under the name "Fundal Endometritis," in which this is prominent: on forcible pressure of the sound against the fundus "absolute agony may result, which may produce vomiting, an hysterical faint or fit, sometimes a regular epileptic fit." The sound is most useful in demonstrating *irregularities of the mucous membrane*, and their recognition is of great importance: to detect these, the sound is held lightly between the finger and thumb and moved slowly backwards and forwards over the mucous membrane; a grating or catching sensation is felt when they are present. We must note, however, as Olshausen points out, that the spongy irregularities may escape detection by the sound.

In the speculum we see, issuing from the os, the leucorrhœal discharge with the characteristics given above; usually it is mixed with that from the cervix. The appearances described under cervical catarrh are also frequently present.

DIAGNOSIS; DIFFERENTIAL DIAGNOSIS.

The curette is invaluable in diagnosis, especially when its use is followed by *microscopical examination* of the scrapings—the importance of which cannot be overrated.

This throws light on the etiological question, whether the endometritis be due to incomplete emptying of the uterus after *parturition.* In such a case, we find among the scrapings large decidual cells or fragments of the villi of the chorion in a state of fatty degeneration. It shows us the *character of the inflammatory changes.* Of these de Sinéty describes three forms on which we based our description of three pathological types of endometritis. The microscopic appearance of these (40 diameters) is given at Figs. 186 to 189.

It enables us to differentiate endometritis from commencing malignant disease—*carcinoma* and *sarcoma.* In carcinoma, we see under the microscope abundance of epithelial cells of irregular form and with many nuclei (*v.* Chap. XXXIX.). In sarcoma we see under the microscope the typical round or spindle-shaped cells. The hemorrhagic type of endometritis may readily be mistaken for sarcoma uteri, because "it spreads in a diffuse manner, pre-eminently causes hemorrhage, produces pain not at all or only late" (Olshausen). The microscope, however, settles the diagnosis. Care must be taken not to mistake the small-celled infiltration of the tissue (Fig. 187) for round-celled sarcoma. The unstriped muscular fibre of the uterus may be present in the scrapings, but could only, on hasty examination, be mistaken for spindle-celled sarcoma. The latter are characterised by their larger size and oval nuclei (*v.* Chap. XLII.).

PROGNOSIS.

Endometritis is not a fatal disease in itself, though, when long protracted, it seriously affects the constitution and produces permanent ill-health. In cases of excessive hemorrhage, the condition becomes grave.

The treatment is often protracted, and the patient should always be warned of this. The occurrence of conception will produce the most fa-

vorable conditions ; and, if due care be taken to prevent abortion in the early months and in the management of the puerperium, we may hope for a cure.

When endometritis is associated with a strumous, tubercular, or syphilitic diathesis, it may baffle all our efforts.

TREATMENT.

A. Of Acute Endometritis.

Rest in bed, warm fomentations over the abdomen, and the free use of opium if there is much pain, form all the treatment required. Should the bowels not be moved freely before the attack, castor-oil, with an enema, should be given, since the loaded rectum presses injuriously on the inflamed uterus. Should the bowels not be loaded, the patient is not to be troubled with purgatives but rather kept under the influence of opium. If there is menorrhagia, ergot is required ; when the discharge is free, it is to be given hypodermically. Warm water injections should not be used until the acute stage is passed, the pain and other signs of inflammation have subsided, and the leucorrhœa is abundant.

B. Of Chronic Endometritis.

Prophylactic treatment is of great importance. A patient who is subject to endometritis should guard against exposure during the menstrual period. When conception takes place, the practitioner should remember the liability to abortion, the importance of seeing that the uterus be thoroughly emptied after parturition, and that the patient take proper care during the puerperium ; in the latter period ergot is beneficial.

We begin with hot water injections, and the administration of ergot ; the liquid extract in doses of twenty drops in water three times a day, increased to thirty at the menstrual period, is the most convenient form.

If the uterine cavity be enlarged so that the sound moves freely within it, if there be roughness of the endometrium, or if there has been a recent miscarriage or confinement, we employ *the curette followed by the application of carbolic acid.* In the last class of cases the cause of the endometritis has been the incomplete separation of the placental villi ; if treated while still recent, such cases furnish the most satisfactory instances of an immediate and complete cure.

Curetting should not be performed while active cellulitis or peritonitis

is present. The fixing of the uterus by adhesions or cicatrisation does not contra-indicate the operation, though they render it more difficult through preventing the uterus from being drawn down by the volsella; when these are present, undue traction must not be made. The time selected for operation is a week after a menstrual period; when the discharge is continuous, the period is indicated by increase in amount.

Curetting of the Uterus with application of Carbolic Acid.—The following instruments are necessary :—

Sims' or Battey's speculum,
Three or four sounds dressed with cotton wool,
Volsella,
Simpson's modification of the dull-wire curette,
Crystals of carbolic acid liquefied,
Cotton wadding and glycerine,
Mackintosh.

Chloroform is not necessary unless the patient be nervous.

The sounds should be covered with a thin layer of cotton-wool, extending almost to the knob (Fig. 190). The sound is dressed as follows: A

Fig. 190.

Sound dressed with wadding for the application of carbolic acid.

film of cotton wadding is laid on the palm of the left hand, the last two and a half inches of the sound are moistened and pressed firmly on the cotton wadding, the left hand is closed over it, the sound is turned twice or thrice round within the shut hand till the cotton wadding becomes tightly rolled on. The dressing must bite the sound firmly so that it may not come off within the uterine cavity, and must not be too thick to be easily carried in. To remove the cotton wadding afterwards, the dressing is unrolled under water.

Thomas' dull-wire curette is the most serviceable, because from its small size it can be used without previous dilatation and from its flexibility it can be curved to suit the form of the uterine canal. A. R. Simpson has distinctly improved it by adding a knob at the two and a half inches, which informs the operator where the end of the curette is. The crystals of carbolic acid are kept in stoppered bottles; at the ordinary temperature

a portion remains liquid; iodine, strong nitric acid, or chromic acid may be substituted for it.

The patient is placed semiprone; Sims' speculum is passed and held by an assistant who with the left hand draws back the upper labium (Fig. 191)—if there be no assistant, Battey's speculum is used and fixed to the mattress; the vagina is washed out with carbolised water. The anterior lip is laid hold of by the volsella and drawn downwards, the volsella being steadied with the fingers of the left hand; the curette is taken in the right hand, dipped in carbolised oil (1–20), and carried into the uterine cavity

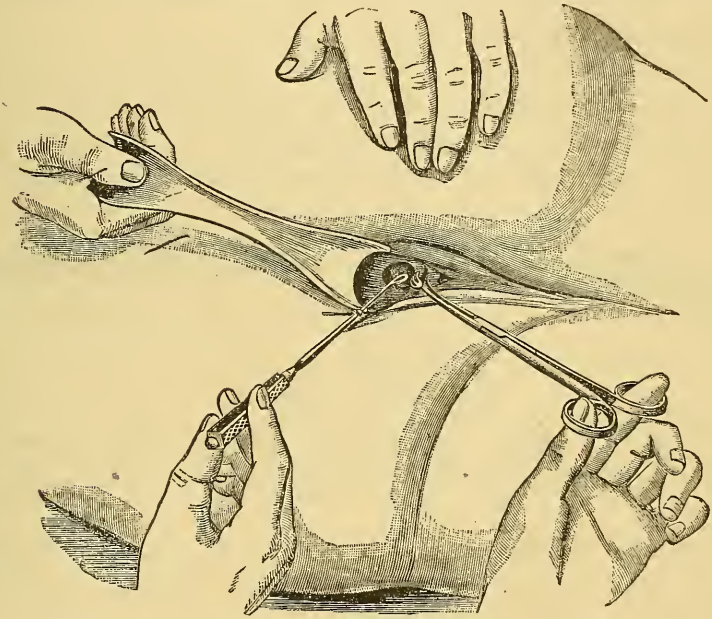

Fig. 191.

Uterus drawn down with the volsella and curette in position. The speculum is held and the labium drawn upwards by an assistant. The operator's hands are crossed (A. R. Simpson).

(Fig. 191). The anterior wall of the uterus is first scraped, from the fundus downwards; only slight pressure on the instrument is made, unless it be felt to slip over the irregularities of the mucous membrane without removing them; the detached fragments are brought down to the cervix with a raking motion, and set aside for microscopical examination: the posterior wall is scraped in the same way. A sound, dressed with dry cotton wadding, is passed to clear away the blood and mucus; the same process is immediately repeated with a second, and with a third if necessary. A reserve sound, previously dipped in the carbolic acid so as to be

ready for use, is carried in immediately after the last of these has been withdrawn; if there is much bleeding or the uterine cavity be large, a second application should be made; our aim is to apply the carbolic acid to the whole of the raw surface, without its being diluted with blood or mucus. The volsella being withdrawn, a pledget of cotton wadding soaked in glycerine is placed in the upper part of the vagina so as to embrace the cervix; this prevents the carbolic acid from running down into the vagina.

The patient keeps her bed for a week after the operation, the pledget having been removed on the second day. Special care should be taken at the next menstrual period.

Applications without a previous curetting are indicated in cases where there is no history of recent parturition or where no irregularities are detected by the sound. (In endometritis fungosa, which specially requires the curette, no irregularities are detected by the sound—Olshausen.) In

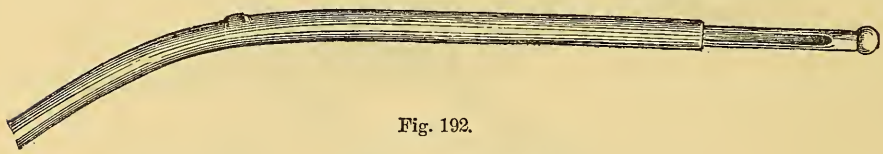

Fig. 192.

Porte-caustique (Sir J. Y. Simpson).

all other cases the preliminary use of the curette is a distinct advantage, as it removes the fungosities and thus allows the caustic to act more efficiently.

Atthill advocates the use of strong nitric acid, and the preliminary dilatation of the cervix with tents so as to allow a thicker dressing of the sounds and more abundant application of the acid. He uses an intra-uterine speculum of vulcanite which is passed within the cervix; this prevents the acid from acting on the cervical canal.

The application may be made in a *solid form*, of which the best is nitrate of silver. This is employed as follows: the nitrate of silver is fused in a water-glass over a spirit flame; a probe with a roughened end is dipped in this and the film allowed to cool, and then dipped again repeatedly till several layers are deposited. Sir James Simpson applied the nitrate of silver in powder on the porte-caustique represented at Fig. 192. The simplest way is to carry an ordinary quill with a nitrate of silver point into the cavity of the uterus; it may be passed in and withdrawn again, or held there till the point melts off; Credé of Leipsic has got very good

results from this mode of treatment. Barnes has devised an ointment positor for introducing ointments or fluids; he applies the iodide of mercury ointment in this way, and also tincture of iodine on a sponge.

The importance of constitutional treatment must not be forgotten. The bowels should be moved regularly by saline aperients; the aloes and iron pill is also useful. The preparations of quinine, iron, and strychnine, are valuable in improving the tone of the nervous and digestive systems.

Cold baths and sea-bathing aid greatly in strengthening the constitution. The water of certain mineral springs, such as Ems and Kreuznach, seems to have a special action on the uterine as well as on other mucous membranes. The regular diet and exercise required at these baths have also, no doubt, their beneficial effect.

The diathesis—strumous, tubercular, or syphilitic—should not be forgotten. In them, the treatment must from the first be constitutional.

Intra-uterine Injections.—Applications to the interior of the uterus are also made in the form of a fluid injected by a syringe. The nozzle of the latter is shaped like a sound, so that it may be passed into the uterine cavity; the barrel is of glass, and is graduated (like a hypodermic syringe) so that the quantity injected (not more than a few minims) is exactly known. The solutions used are carbolic or chromic acid, tincture of iodine or perchloride of iron, nitrate of silver, and sulphate of iron or copper. The cervix must be well dilated, to allow the fluid to escape readily past the nozzle of the syringe. To facilitate this reflux, syringes have been devised with a double canula. Injection of fluid *into the non-puerperal uterus* is not unattended with risk (*v.* p. 188), and the fact that we have the equally effective and perfectly safe method of intra-uterine medication described above renders it unnecessary. As a means of treating endometritis it is condemned by the general opinion of gynecologists in this country and America; in France and Germany, however, it is extensively practised. For further details of this method the student may consult the following references: Klemm—"Die Gefahren der Uterininjection," Leipzig, 1863; Cohnstein—"Beiträge zur Therapie der chronischen Metritis," Berlin, 1868; Leblond—op. cit.; and Hegar und Kaltenbach—op. cit., S. 104.

END OF VOLUME I.